

X

MEMOIRS
FOR THE
NATURAL HISTORY
OF
Humane Blood,

Especially
The Spirit of that Liqueur.

By the Honourable
ROBERT BOYLE
Fellow of the Royal Society.

Esse enim haud pauca, eaq; ex præcipuis, supersint absolvenda, tamen consilium est universum opus potius promovere in multis, quam perficere in paucis. Verulam. in Præfat. ad Histor. Natural. & Experiment.

L O N D O N,
Printed for Samuel Smith at the
Princes Arms in St. Pauls
Church-yard, 1684.



THE
Preface Introductory

ADDRESSED

*To the very Ingenious and Learned
Doctor J. L.*

I Willingly acknowledge, that
divers Physicians have Am-
ply and Learnedly, and
some of them very Eloquently,
set forth the praises of the Blood,
and manifested how noble and
excellent a Liquor it is, But I
must beg their pardon if I doubt
whether their Writings have not
better celebrated its Praises,
then discover'd to us its Nature.
For, tho' the laudable curiosity

A 2 of

The Preface.

of the Moderns has acquainted us with several things not deliver'd to us by the Ancients, yet, if I mistake not, what is generally known of Humane Blood, is as yet imperfect enough, and consists much more of Observations than Experiments; being suggested far more by the *Phænomena* that Nature her self has afforded Physicians, than by Tryals industriously made, to find what she will not, untolicted by Art, discover. I will not be so rash as to say, that to mind (as too many Anatomists have done) the Solid parts of the Body, and overlook Enquiries into the Fluids, and especially the Blood, were little less im-

The Preface.

improper in a Physician, than it would be in a Vintner to be very solicitous about the Structure of his Cask, and neglect the consideration of the Wine contain'd in it. But though I will not make so bold a Comparison, yet when I consider how important a part of the Humane Body, the Blood is; and that as when it is well constituted, and does orderly move, it conveys nourishment and vigour, and motion, and in a word health to the rest of the living Engine: So the Mass of Blood being either vitiated, or (which is very often the effect of that Depravation) disorderly mov'd, is the *Seat of divers*, and

The Preface.

the *Cause* of most Diseases, whose cure consequently depends mainly upon the rectifying of the Blood when (I say,) I consider these things, I cannot but think it an Omission, that so important a Subject has not been more skillfully and industriously enquir'd into. But I hope you were not in earnest, when you solicited *me* to repair that Omission. For you know, I have not the Vanity to pretend to be a Physician. And being none, I must want both the Skill and many Opportunities, wherewith a Man that were professedly so, would be advantag'd. And *though* I deny not that many years ago I propounded to some Ingenious Physicians

The Preface.

Physicians a History of the Fluid parts of the Body, such as the Humours and other Juices, and also the Spirits of it; and did particularly draw up a set of Enquiries, and make divers Experiments in reference to the Blood, yet those Papers being since lost, and a long Tract of Time, and Studies of a quite other nature, having made me lose the Memory of most of the Particulars; I find my self unable to contribute any thing considerable to your laudable design. And as all the search your Commands oblig'd me to make after my Papers, has hitherto prov'd fruitless, so they having been written when I had far more

The Preface.

Health, Vigour, and Leisure than I now have, and when my Thoughts were much more conversant with Medicinal Subjects; any thing that I shall now present you about the Blood, will not only be extremely short of what ought to be said, but will also be short even of what, if I mistake not, I did say of it. But yet all this is said, not to excuse me from obeying you at all, but to excuse me for obeying you so unskillfully. For, since you will have me set down what I can retrieve about Humane Blood, you shall receive it in the following Paper; which consists of Four Parts. The *First* whereof contains a *set of Titles* (which

The Preface.

(which I call *Of the First Order*, for Reason is to be given you in the Advertisements about them) towards the Natural and Medical History of Humane Blood, which may direct those that want better Guides, what Enquiries to make, and to what Heads to refer, what they have found by Observation or Tryal. But because this Part contains but bare Titles (whole Systeme yet perhaps I look upon as likely to make the usefulest part of the ensuing Papers) and because I have neither leisure nor Materials to answer all or most of the Titles, I thought fit in a couple of Subjects, namely the *Serum* of Humane Blood, which is a
Natural,

The Preface,

Natural, and the Spirit, which is a *Facitious* part of it, to give some instances of what I had thoughts to do on others; and propose some Example to those that may be more unpractis'd in drawing up Natural Histories, than the general design and course of my Studies of Natural Things permitted me to be. And what is said on these two Subjects, makes the *Third* and *Fourth* Part of these Papers. As for the other Titles (of the History of the Blood) I contented my self, in compliance with my haste, to set down what occur'd to me in the Casual Order wherein they offer'd themselves; without scrupling
to

The Preface.

to mingle here and there among the Historical Notes, some Experiments that I formerly but design'd, as Tryals that might prove Luciferous, whatever the event should be. This Rapso-
dy of my own Observations makes one of the Four Parts, and the *Second* in Order, of what your Commands embolden me to offer you at this time. And I shall be very glad to be so happy as to find, that by doing a thing, that I am wont to do so delightfully as to obey you, I have by breaking the Ice contributed something to so noble and useful a work as *the History of Humane Blood*. About which, that I may not make the Porch much

to.



The Preface.

too great for the Building, I shall add to this Preamble nothing but these two Advertisements; of which the First shall be, That it is not my design in these Papers, to treat of my Subject, as it may be consider'd (to borrow a School Phrase) *in fieri*, which would have oblig'd me to trace the Progress from the reception of Aliments at the Mouth, to the full Elaboration, which were to write the History of *Sanguification* as well as that of Blood; but to treat of this Liquor as 'tis compleatly elaborated, and that too, not as 'tis form'd in the Vessels of a living Body, but as it is Extravasated, and let out by the Lancet;

The Preface.

I
o-
e-
ll
n
y
d
m
d
n
t
e
l
f
y
t
a
-
-
;
cet; such Blood alone being that
on which I had some opportu-
nity to make Tryals, and to
this first Advertisement, I shall
subjoyn as the Second, That in
the following Papers I have, as
the Title intimates, treated but
of such Humane Blood, as was
taken from sound Persons; *both*
because being no profess'd Phys-
cian, I had not the Opportunities
of Examining that of Sick Per-
sons molested with particular
Diseases, (which yet would
much conduce to a compleat
History of the Blood;) *and* be-
cause the Knowledge of the
Nature of the Blood, when 'tis
rightly conditioned, is necessary
to those that would discern, in
what

The Preface.

what particulars, and how far it deviates in the Sick, according to that generally received Axiome, *Rectum est Index sui & Obliqui*: On which account the Scheme of Titles drawn up for the *History of Healthy Blood*, may serve for a direction to any that would write the *History of Morbid or Depraved Blood* in any particular Disease, as a Pleurilie, a Quartan Ague, the Dropsy, the Scurvy, &c. For having compared the Qualities and Accidents of this vitiated Blood, with those of the Blood of Sound Men deliver'd in the forementioned Systeme of Titles, 'twill not be difficult for a Physician to find, to what heads he is to refer

The Preface.

refer those things that considerably recede from such as belong to Healthy Blood. And these Recessions or Depravations, with perhaps a few Additions of some Peculiarities, if any occur, will make up the History of the Blood as 'tis wont to be vitiated in that Particular Disease, one General Admonition sufficing (if that it self be not unnecessary) to make the Reader take notice, that in all other Points the Blood of Persons sick of that Disease is not unlike that of those that are Healthy.

This

This Book being Printed in the absence of the Author, some Errata's have escaped the Press which be pleas'd to correct thus.

PAg. 4. line 4. for *he takes* read *it takes*. p. 12. l. 8. for *her* r. *the*. *ibid.* l. 14. for *verts* r. *Salts*. p. 18. l. 23 for a *Blood* r. *Blood*. *ibid.* l. 24. for *Liquor* r. a *Liquor*. p. 30. l. 12. for *Urine* r. *Wine*. p. 57. l. 15. for *or*, r. *and*. p. 65. l. 5. for ζ viii. r. ζ viii]s. p. 70. l. 25. for *the Water*, r. *in the Water*. p. 77. l. 25. for *at* r. *a*. p. 100. l. 5. for *which* r. *with*, p. 140. l. 2. for *operation of this* r. *operation*. *Of this*. p. 157. l. 18. for *weeks* r. *months*. *ibid.* l. 19. for *months* r. *weeks*. p. 187. l. 10. these words, *For the first Salt of Blood does it self much resemble* *as* *Salt*, whether its Spirit be *Acid* or *no*, should be included in a *Parentthesis*. p. 190. l. 12. for *so* r. *so close*, p. 194. l. 15, for *bale* r. *bare*. p. 215. l. 21. for *Diplegm'd Sulphur* r. *Diphlegm'd Sulph.* r. p. 217. l. 10. for \dagger in which r. *in which*. p. 225. l. 11. for *Historius* r. *History*. p. 228. l. 13. for *their* remain'd ζ i]. \dagger r. *there* remain'd ζ ii]. \dagger p. 229. l. 10. for *portion* r. *proportion*. p. 230. l. 9. for *their* r. *there*, *ibid.* l. 10. for *Fourteen* r. *Thirteen*. p. 233. l. 3. for *subliming Salt* r. *subliming the Salt*. p. 234. dele the first three lines *Experiments belonging*, &c. p. 252. l. 15. for *by* r. *that by*. *ibid.* l. 16. for *what* r. *one may see what*. p. 259. l. 3. deest [*Experiment I.*] p. 268. l. 12. after *made* deest. [*Having set down these Preliminaries, I shall proceed to*] *Experiment I.* &c. p. 274. l. 3. deest [*eighth.*] p. 282. for *Conclusion* r. *Post-script*.



I

THE

Natural History

OF

Humane Blood.

PART. I.

*Containing A List of Titles for the
History of Humane Blood. To which
are Premis'd some Advertisements
about them.*

That the Scope and meaning
of the ensuing Scheme of
Titles, (and divers others
that I drew up for differ-
ing Subjects) may be the more clear-
ly understood, I must lay down in this
place some passages borrowed from
B the

the (unpublish'd) Essay or Letter I wrote to Mr. *Oldenburg* (Secretary to the R. Society) about the way of compiling a Natural History. I propos'd then in that tract three sorts of Heads, to which the particulars that might occur, and properly belong to the History of the Subject to be treated of, whether a *Body*, or a *Quality* or an *Operation*, or a *Process*, (that is, a progressive change) might conveniently be referred. These distinct sets of Topicks or Enquiries I call *Orders*, Ranks or *classes*, and because to each of these sets, it was found by Experience, that things of somewhat differing nature were to be referr'd, as *Queries* more properly So called, *Propositions* either Affirmative or Negative, and other Heads of Natural History, that are less fit to be reduc'd to either of the two former Sorts, then to be look'd upon as Subjects to be treated of. For this reason, I say, among others, I thought fit to comprize all these sorts of particular Topicks, or Articles of Inquiry

Inquiry (to use our illustrious *Verulam's* phrase) under the general and comprehensive name of *Titles*.

The *first Order* or *Classis* of these Titles, I would have to consist of such as occur'd readily enough to my thoughts, upon the first deliberate view, or general Survey, of the Subject to be treated of. For 'tis scarce to be expected that at the first attempt a man should be so clear sighted, or so happy, as to pitch, or light upon as direct and compendious ways of Indagation, and as good Methods of Digesting, and delivering what is discovered, as when a studious Enquiry has furnish'd him with better Informations about the Subject he is to treat of; and therefore it may suffice for the *first* time, that the mind do as it were walk round the Object, it is to contemplate, and view it on every side, observing what differing Prospects it will that way afford, (as when a Painter or an Anatomist

4 *The Natural History*

looks upon a mans Body, first when the Face and Belly are towards him, then when the Back and other hinder parts are so) and that he takes notice of the Limits and Boundaries of it, and of the most Essential and considerable Parts, or other things that belong to it. Wherefore in the first *Classis* of Titles, one need not be too scrupulous about the enumerating, and marshalling the Particulars referable to it, but may be more Solicitous, that the Titles should be various, and comprehensive enough, than that they should be nicely Methodical, and much less than that they should be accommodated to any particular *Hypothesis*. And because, even at the first deliberate view, some (though perhaps very few) of these Titles may appear considerable, and fertile enough to deserve, that there should to each of them be refer'd two or a greater number of Subordinate, and more particular Topicks ; I thought fit for methods sake to call the Capital

tal Titles, that is those of the first *Classis*, *Primary Titles*, and the Subordinate, *Secondary ones*. [Of which Distinction a Notable Instance will be met with in what is hereafter delivered, about the Spirit of Humane Blood. All the Sixteen Titles together with the *Appendix*, contained in that Epistolary Discourse, being Secondary Titles, referable to that Primary one, which is the Eighteenth in the first *Classis* of the History of Humane Blood.]

When by Reading, Conference, Meditation, and (which is here mainly to be consider'd) the Tryals suggested in the Topics of the first *Classis*, or order, the Naturalist has receiv'd the best and fullest Information he can procure, of all that belongs to the Subject he is to treat of, he may then proceed to frame another set of Titles, which may be called the *Second*, or (if no other interpose) the last Order or *Classis* of them, which, if he have been diligent and any

6 *The Natural History*

thing prosperous, will be much more copious and better rang'd than the *first*.

For now divers things will in likelihood appear to belong to the Subject of the History, which were not at first taken notice of to do so, yea perhaps were not at all thought of, and the further discovery made of the nature of the thing treated of, may direct the Historian to range his Topics, or Titles in a better Order, and more natural Method, than those of the *first Classis*. And, which is a thing of far greater Moment, divers, and perhaps most, of the Particular Titles will appear to be of greater extent, or more comprehensive, than they were formerly conceived to be: so that a Particular Title may well be thought fit to be branch'd into many Subordinate Topics, or Articles (which we lately call'd Secondary Titles) some one of which may perhaps comprize as many Experiments, or Observations, as 'twas at first guess'd would

would appertain to the prime or more general Title itself. And from the Materials orderly drawn together under this last set or *Classis* of Titles, with some requisite changes in point of Method, and Connexions, and some Additional things as Transitions &c. by the help I say, of such Alterations and Additions, the Particulars whereof the last Order or *Classis* consists, may be digested and framed into an Inchoate Natural History of the Subject they have relation to; I said, an *Inchoate History*, to intimate, that even after all that has been already done, I think it too probable that the History will hereafter appear to have been rather begun than compleated, the nature of things, & the Industry of skilful men being so very fertile, that the knowledg of the Subject of the History will from time to time be increas'd, and so the History it self may be enlarged and corrected, but will not, I fear in many Ages, if ever it be at all, be made absolutely perfect.

And on this occasion I must add That when the Subject to be treated of is very comprehensive or very Difficult, as the *Generation of living Creatures, Magnetism, Fermentation, Gravity, &c.* it may be very useful, if not almost necessary, to interpose between the Titles of the *Last* and those of the *First Classis*, a set of Titles that may be call'd of the *middle Order*, or *Classis*. For the framing whereof the Historian^m is considerately and narrowly to survey the Nature of the Subject, and make a heedful Collation of that, and of the several Notices attain'd by his Endeavours to furnish the differing Titles of the first *Classis* with a Competent number of Particulars. For by this Collation there will in likelihood be suggested to him, many new Topics of Enquiry, and Hints, which added to the former will deserve to have a new *Classis* fram'd consisting of Articles more copious, and various than the First, and fit to be rang'd
in

in another Order. It may perhaps illustrate what I have been saying and am going to say, about the several *Classes* of Titles, if on this occasion I shall add, that a Natural Subject being proposed to be Historically treated of, there may occur something like what happen'd to the *Israelites*, in reference to the Land of *Canaan*. For at their first entrance into it, *Joshua*, and the other Spyes took a transient view of the Country, and could bring back but an unaccurate account of it, together with a little of the most remarkable Fruit. But upon a second Expedition, the Spyes were furnished with fuller Instructions, and order'd to direct their Researches to the answering of a great many particular Articles of Enquiry ; their Industry to answer which produced in Methodical Tables or Schemes, a far more copious and distinct Chorography, and Survey of the fruitfull land of *Canaan*.

It is scarce to be expected that

at

at the very first time the *Titles*, whether Primary or Secondary, of a natural History should be made so comprehensive, and be so skilfully bounded, as not to need to be either enlarged, or reformed by Second Thoughts, and a further Progress in the Practical knowledge of the Subject treated of. I therefore thought it necessary, or at least useful, to subjoin to the first Edition of the *Titles* of each of the Natural Histories, I delineated, a *Mantissa* or *Appendix*, that should consist of two Sorts of Particulars; viz, *Paralipomena* and other *Addenda*, whereof the *first* should contain such things, as may be properly referrable to some one or more of the *Titles*, (either Primary, or Secondary,) distinctly enumerated in the Scheme of the History, and were but by haste or oversight kept from having place among them. The *other* consists of new Particulars, that, after

of Humane Blood.

11

after the History was written, were Suggested by further Discoveries ; whether these Particulars did directly belong to any of the preceding *Titles*, or might only in a general way contribute somewhat to the knowledge, or illustration of the Subject.

Titles of the First Order.

For the Natural History of Humane Blood of Healthy men.

1. **O**F the Colours of Humane Blood Arterial and Venal.
2. Of the Taste of Humane Blood.
3. Of the Odours of Humane Blood.
4. Of the Heat of freshly emitted Humane Blood.
5. Of the Inflammability, and some other Qualities of Humane Blood.
6. Of the Aerial Particles naturally mix'd with Humane Blood ;

12 *The Natural History*

Blood; and also found in its distinct Parts.

7. Of the Specifick Gravity of Humane Blood entire.
8. Of the Specifick Gravity of the two obvious Parts of Humane Blood, the Red (and Fibrous) and the Serous.
9. Of the Consistence of entire Humane Blood.
10. Of the Disposition of Humane Blood to Concretion, and the Time wherein it is performed.
11. Of the Liquors and Sorts that coagulate Humane Blood.
12. Of the Liquors and Salts that impede or dissolve its coagulation.
13. Of the Liquors, &c. that preserve Humane Blood.
14. Of the Mixtures that Humane Blood may admit from Aliments.
15. Of the Spontaneous or natural Analysis of Humane Blood into a Serous and a Fibrous part.
16. Of the respective Quantities of the Serous and Fibrous part of Humane

of Humane Blood.

13

Humane Blood.

17. Of the Differences between the Serous and the Red part of Humane Blood.
18. Of the Artificial or Chymical Analysis of Humane Blood, and first of its Spirit.
19. Of the Vol. Salt of Humane Blood, and its Figures.
20. Of the Phlegm of Distill'd Humane Blood.
21. Of the two Oyls of Humane Blood.
22. Of the Fixt Salt of Humane Blood.
23. Of the *Terra Damnata* of Humane Blood.
24. Of the Proportion of the differing Substances chymically obtain'd from Humane Blood.
25. Of the Fermentation or Putrefaction of Humane Blood, and its *Phænomena*.
26. Of the Mechanical uses of Humane Blood, as in Husbandry, &c.
27. Of the Chymical uses of Humane Blood.
28. Of

14 *The Natural History*

28. Of the Medicinal uses of Humane Blood.
 29. Of the Difference between Humane Blood as 'tis found in sound Persons differingly constituted and circumstantiated, as men, women, (when menstruous, and when not) Children Moors, Negro's, &c.
 30. Of the Affinity and Difference between the blood of men, and that of divers other Animals, as Quadrupeds, Birds, Fishes, and Sanguineous Insects.
-

An Appendix, containing

- 1 **P** *Aratipomena* relating to the History of Humane Blood.
2. Miscellaneous Observations, Experiments and Enquiries about Humane Blood (to be added to the History of it.)

I do

I do not think it unlikely that some of the Titles of our intended History of Blood and a greater number of the particulars that you will meet with in it, may seem frivolous to you at the first perusal. But perhaps in process of time, these very things will not appear impertinent, nor be found useless. For 'tis a matter, as of more difficulty, so of more utility, than men are wont at first to discern, to find out, and bring into a narrow compass, a considerable number of particulars relating to one Subject, and present them as it were at one view, to the Intellect to act upon. And there is many a particular Experiment or Observation which upon the first, or perhaps the 2d reading may seem but slight or Superfluous, which afterwards is found capable of being made good use of by those who seriously intend, and endeavour to attain, not a main'd or a Superficial, but a deep and solid knowledge of the Subject of their Enquiry.

Enquiry. And to such Indagators many particulars, that at first were past by unregarded, because there appeared no direct use or obvious application of them, will be found serviceable to hint new *Hypotheses* or Theories, or to illustrate them, to examine those of others, and if they be true, to confirm them, and if erroneous, to confute them. For, to be short, the knowledge of matters of fact cannot but be some way or other, and probably more ways than one, serviceable to a Naturalist, that has Sagacity and Judgment to make a right use of them.

Having already advertis'd you, that the following Papers treat of none but Extravasated Blood, since I had no other at command, to make my Tryals upon ; I presume you will not wonder that you find not in the Scheme of Titles such as these.

Of the *Process* of Sanguification, or the *Series* of changes that the Aliment successively undergoes, from
its

its being taken in at the mouth, till it be turned into Blood.

Of the motions of the Mass of Blood, and particularly its Circulation.

Of the Chyle, *Lympha*, and other Liquors, that are suppos'd to enter and mingle with the Blood.

Whether the Humours, Phlegm, Gall, and Melancholy, be really contained in the Blood, as constituent Parts of it.

Whether some other substances may not with as much reason be admitted into the composition of the Blood.

These, as I was saying, and perhaps some other Titles should have been added, if my Design had reach'd further, than to treat of Blood separated from the Body, and I wish that you, who by your Abilities and Profession are far better qualify'd than I for such a work, would fill up these, Titles and add them, some as Preliminaries, and others as *Appendices*,

to the History of Blood I have adventur'd to begin.

Perhaps it may not be altogether impertinent to add, that I had once some Thoughts of a Designation of a Natural History of other Liquors of a humane Body, as well as the Blood; I mean such as the Gall, the *Lympha*, the *Succus Pancreaticus*, Spittle, Urine, Milk, &c. But I quickly perceiv'd it was fit for me to resign such Tasks to Physicians; only I shall here Subjoin, as a small *Specimen*, a set of Titles for the History of Urine, which though by reason of its Affinity in many regards to Blood, it must have many Titles in common with it, yet some will be differing according to the nature of the Subject; which (Liquor) I therefore pitch upon, because I dare own to you, and I do it not without Premeditation, and having wrought on Urine longer than on a Blood itself, that I think Urine to be Liquor, which, as much despis'd as it is by others, deserves to be solicitously enquir'd

quir'd into by Physicians, Naturalists, and upon special Accounts by Chymists; who will perhaps be excited to seek and hope for great matters, both for Medicine and Alchymy, from this Liquor skillfully handled, when they consider that the *Phosphorus*, of which I have elsewhere related so many new, and some of them surprizing, *Phænomena*, is made, at least according to my way of Meer Urine by a Simple Distillation.

C 2

Titles

*Titles of the First Classis,
For the Natural History of Humane
Urine emitted by Healthy men.*

- 1 **O**F the Colours of Humane Urine.
2. Of the Taste of Humane Urine.
3. Of the odours of Humane Urine fresh and putrify'd.
4. Of the Heat and Cold of Humane Urine.
5. Of the Specific Gravity of Humane Urine.
6. Of the Consistence of Humane Urine, as to Density, Viscosity, &c.
7. Of the Aerial Particles contain'd in Humane Urine.
8. Whether Humane Urine is a fit Liquor for Fermentation properly so call'd.
9. Of the Differences between fresh and stale Humane Urine.

10. Of

10. Of the Fermentation or Putrefaction of Humane Urine, and the time it requires.
11. Of the Spontaneous Separation of Parts in Humane Urine.
12. Of the vulgar Analysis of Humane Urine by Distillation.
13. Of some other ways of distilling Humane Urine.
14. Of the Proportion of the Principles, or Ingredients of Humane Urine.
15. Of the Spirits of Humane Urine.
16. Of the Phlegm of Humane Urine.
17. Of the Volatile Salt of Humane Urine.
18. Of the Fixt Salt of Humane Urine.
19. Of the compounded Salt of Humane Urine.
20. Of the shining Substances obtainable from Humane Urine.
21. Of the Salt that is predominant in Humane Urine,

22 *The Natural History*

22. Of the Emphyreumatical Oyl, or Oyls of Urine.
23. Of the *Mellago*, or Rob of Humane Urine, and its uses.
24. Of the *Terra Damnata* of Humane Urine.
25. Of some accidental Differences of Humane Urine, as 'tis emitted in the morning, or at certain Distances from meat, or after the use of certain Aliments, or Medicaments, as Sparagus, Turpentine &c. Or at differing Seasons of the year, as Winter, Summer, &c.
26. Of the Affinity of Humane Urine with divers other Bodies, especially Vegetable and Mineral.
27. Of the Hostility of Humane Urine with Acids, &c.
28. Of the Affinity and Difference between Urine, Blood, Gaul, Milk, &c. and divers other Liquors, or Juices belonging to the Animal Kingdom particularly of the comparison between Humane Urine and that of Beasts.

29. Of the Mechanical uses of Human Urine.
 30. Of the Chymical uses of Humane Urine, and its parts especially as *Menstruums*.
 31. Of the Medicinal uses of Humane Urine, External and Internal.
-

An Appendix, containing

- 1 **P** *Aralipomena* relating to the History of Humane Urine.
2. Promiscuous Observations, Experiments and Inquiries about Humane Urine, (To be added to the History of it.)

The II. Part.

*Containing Miscellaneous Experiments
and Observations, about Humane
Blood.*

IF I were furnished with all the former Experiments, Observations, and Papers, that at several times I made, and wrote about Humane Blood, or were supplied with Materials and Opportunities to repair the want of them, (as possibly, God assisting, I may hereafter be,) this Second Part of our Work would perhaps appear much less maimed, and jejune, than it will now be found. But I am so sensible of the disadvantage, that the want of those requisite helps must have brought to this *Rapsody* of unconnected Notes, (written at differing times, and on differing occasions,) that I was more than once inclin'd

clin'd totally to omit it. And 'tis the importance of the Subject, upon which even mean Experiments may sometimes prove of good use, that keeps me from suppressing it. Which I thus early give notice of, that nothing more than loose Experiments, and those referable but to *some* of the Titles of the History of Humane Blood, (*divers others* being left untouch'd) may in the Second Part of our Memoirs be expected.

To

To the IV. (Primary) Title
OF THE

History of Humane Blood,

Experiment I.

HAVING for some reasons, that need not here be mention'd, been induc'd to enquire of more than one person, that has us'd to let many men Blood, whether they did not observe, that some persons found a manifest and considerable change in the heat of the Blood, as it came to issue out first or last? I was answered Affirmatively and told that several persons that had no Feaver said, that after their Blood had run out a while, they found it come sensibly hotter than before; and some of them complain'd, that it came with a degree of Heat that was troublesom, and as they fancy'd, ready to scald them. To

To the same Title

OF THE

History of Humane Blood.

Experiment II.

I Got a Chirurgeon to put a seal'd Weather-glass, adjutt'd by the Standard of *Gresham* Colledge, into the Porringer wherein he was going to bleed a young Gentlewoman, that, as the Blood ran out of the open *Vein*, it might fall upon the Ball of the Instrument; in which the Liquor was made by the warmth to ascend a good way, but not much (if at all) nearer than about an Inch to the smaller upper Ball of the Thermoscope.

To

To the same Title,

Experiment 3.

BUt within less than an hour before this time, having procured a man of middle age (that seemed healthy enough, and was let blood in the same Shop by the same Chirurgion) to bleed upon the same Weather-glass, the tinged Spirit of Wine ascended above all the Marks belonging to the Stem, and from the top of the stem expanded it self to a considerable quantity in the small upper Ball of the Stem, (for the Chirurgion told me it was a fourth part of the height of the Ball;) so that, though we could not determine how high it would have risen if the Stem had been long enough, yet it seem'd manifest that the Warmth that made it rise, did considerably exceed the usual

usual Warmth of the Air in the Dog-days, these gag'd Thermoscopes being wont to be so fram'd, as to keep the Liquor in the Stem all the year long without sinking quite into the greater Ball in Winter, or ascending into the lesser in Summer.

We employed also, when a young Woman was blooded, a sealed Thermometer that was not gag'd, but was much shorter than the other, and in this the tincted Spirit was raised almost to the top, which argued no inconsiderable degree of Heat.

To the same Title,

Experiment 4.

I know not whether it may be worth while to take notice on this occasion, that a Porringer whereinto a healthy man had been let blood having been brought from the Chirurgeons house to my Lodging, though the Blood was already Coagulated, yet when I thrust into it the Ball of the forementioned gag'd Thermoscope, it appeared to have retained Warmth enough to make the Spirit of Urine ascend, by my guess, at least Three or Four fingers breadth above its former Station.

To

To the V. Title
OF THE
HISTORY.

Since Humane Blood does in Distillation afford a not inconsiderable quantity of Oyl, one may well suppose it to be a Combustible Body: but every one will not think it so Inflammable, as upon Tryal purposely made I found it to be. For having taken a piece of Humane Blood dried till it was almost pulverable, and held it in the flame of a Candle, it would take fire, and afford a Flame much like that which excited it, burning with a crackling noise (much like that of Sea Salt cast into the Fire) and here and there melting. But the Inflammableness of such dried Blood did much better appear, when putting together 4 or 5 thoroughly kindled Coals, we laid on them a piece of dry'd Blood
of

of the bigness of a small Nutmeg, or thereabouts, for this yielded a copious and very yellow Flame, and if it were seasonably and warily blown from time to time, as the *Effluvia* degenerated into smoak, it would by these frequent re-accensions continue to yield clear and Yellow Flames of no contemptible bigness (in proportion to the Body that yielded them) much longer than one would expect. And during a good part of this Desflagration, the Blood appeared as it were to fry upon the Coals, and in good part to melt into a Black substance almost like Pitch. There was also a crackling noise produc'd, like that which Chymists observe when they decrepitate common Salt.

These Experiments for the substance were repeated But I shewed another Instance of the Inflammableness of Blood, that was somewhat surprising. For, having caus'd some Humane Blood (being part of the same that was made use of in the foregoing

foregoing Tryals)to be so far dry'd that it was reducible to fine Powder, I took some of this Powder that had past through a fine Search, and casting it through the Flame of a good Candle, the grains in their quick Passage through it took fire, and the Powder flash'd, not without noise, as if it had been Rofin. This Experiment was reiterated with success.

To the VII. Title

OF THE

HISTORY.

THE specific Gravity of Humane Blood is more difficult to be determin'd, than one would readily imagine. For the Gravity of Blood may differ sensibly in several persons

D

according

according to their Sex, Age, Constitution, &c. And in the same person it may be varied by the time of the year, and of the day, and by being drawn at a greater or lesser distance from a Meal, and by divers other Circumstances. But besides all these things there is a Mechanical difficulty, if I may so call it, that attends the work we are speaking of. For the Blood begins to coagulate so soon after it is emitted, that 'tis scarce a practicable thing to weigh it hydrostatically, either by immersing into it a Solid Body heavier than it self or by weighing the whole Blood in Water; the former way being opposed by the *fibrous* part of the Blood, and the latter by the *Serum*. And upon the same account it is somewhat (though not so much) difficult to compare with any accurateness, the weight of Blood, with that of water in a Glass, as also for other reasons which he that shall considerately go about to try it, will quickly find

But

But however, since it may be a thing of considerable use, to have some tolerable Estimate, though not an exact one, of the difference in Gravity between Water and Humane Blood, by which so many parts of the Body, consistent as well as fluid, are by various *charges* of Texture both constituted and nourished. I shall subjoin a Tryal, that this consideration invited me to make as well as I could. We took the Blood of a sound man emitted all at one time, and put the whole mass of it, as well the Serous as the Fibrous part, into an oblong Glass, of the fittest size and shape we could light on amongst several. And having suffered the Blood to rest till all was settled, and the many Bubbles vanished, we carefully mark'd with a Diamond that narrower part of the Glass, which the upper surface of the Blood reach'd to. Then we weigh'd the Glass and the Blood in a very good Ballance and having

D 2

pour'd

poured out the Blood (for other uses) and washed the Glass, it was filled with common Water to the lately mentioned Mark, and then weighed again in the same Ballance; afterwards the Water being poured out, the Glas alone was Counterpoised in the same scales, and its weight being deducted from each of the two formerly mentioned weights, the Water was found to have weighed zix. 3vi. 50. Gr. And the Blood (equal to it in bulk) to have weigh'd zix. 3ij. 4. Gr. So that the difference Between them being 3ij. 14. gr. the Blood was beavier than so much Water, but about the 25th part (for I omit the Fraction) of its own weight. But this Experiment, for the Reasons above intimated, deserves to be reiterated more than once.

To the XI. Title

OF THE

HISTORY.

T *Hough* rectified Spirit of Wine be a *Menstruum* consisting of very subtil parts, and upon that account be a good Dissolvent of divers Vegetable Substances, and as Experience has assured me, of some Metalline ones too, that seem to be more solid than the Fibrous part of Humane Blood; yet looking upon this Body as of a very differing texture from those, I thought Spirit of Wine might have a very differing Operation upon it. And accordingly having separated from the

D ; Serum

To

38 *The Natural History*

Serum a clot of Blood, that was coagulated but soft enough, as the Fibrous part uses to be before 'tis dryd, I kept it for divers hours in a very well dephlegmed Vinous Spirit, from whence I afterwards took it out as hard as if it had been well dry'd by the fire.

To the XIX. Title
OF THE
HISTORY,

Experiment 1.

THe Volatile Salt of Humane Blood as fugitive as 'tis, is yet so fusible, that if it be dextrously handled, one part of it may be brought to melt, and as I have tryed, even to boil, whilst the rest is flying away.
The

The like I have tryed with some other Volatile Salts, and I presume the Observation will hold in most, if not all of them.

To the same Title,

Experiment 2.

T*Hoagh* the Volatile Salt of Humane Blood, when 'tis by sublimation made white and clean, seems to be a very homogeneous Substance and according to the Principles of the Chymists ought to be so; yet I am apt to suspect, either that its Substance is not altogether Similar, or that the Corpuscles that compose it are of sizes, if not also of shapes, differing enough. For having weighed out some Grains of a resublimed Salt of Humane Blood, that seemed very pure, the Odour was so strong and

diffusive, that one would have expected the whole Salt, being but six Grains, should in a few hours evaporate away, especially being left in a South Window exposed to the Air in a flat piece of Glas. And yet several days after, if I mistake not seven or eight, I found the Salt so little diminish'd as to its sensible bulk, (for I did not think fit to weigh it) that it seemed to have wasted but little, and yet what remained had scarce any odour at all that I (whose Organs of smelling are acute enough) could well perceive, notwithstanding which this White Body retain'd a saline Taste; and a little of it being for tryals sake put upon a solution of common Sublimate in fair Water, readily turned it White. So that it seemed that the penetrant and diffusive Odour of the Volatile Salt of Blood proceeded from some Particles much more subtile and fugitive than the other parts that composed it. But this Experiment ought to be reiterated with

with differing Quantities of Salt by which means perhaps a heedful observer may *discover*, whether the comparative Fixity of the Salt, that remains after the Odorous Particles are (at least for the most part) flown away, may not arise from their Coalition with some Acid Corpuseles that are wont to rove up and down in the Air, and adhere to Bodies, disposed to admit their Action.

To the same Title,

Experiment 3.

A dram of Volatile Salt of Humane Blood sublim'd in a lamp furnace, was put into as much common Water, as in a narrow Cylindrical Glass served to cover the whole Ball of our Standard or gag'd Thermoscope, and when after this had stood a while in the Water

42 *The Natural History*

Water to be brought to its temper, we put in the above mentioned Salt, the tincted Spirit of Wine manifestly subsided about two tenth parts of an Inch, and probably would have fallen lower if there had been more water in the vessel, to make a seasonable solution of the Salt, whereof a considerable part lay undissolved at the bottom.

To the same Title,

Experiment 4.

VW Hen we perceived the Liquor to subside no more, we put to it by degrees some strong spirit of Nitre, till it would no longer make any manifest conflict with the dissolved Salt. The event of which Tryal was, that the Liquor in the Ther-

Thermoscope began presently to mount, and continued to do so as long as the conflict lasted, at the end of which we found by measure, that it had ascended more than three Inches and a half above the Station it rested at when the Ebullition began.

To the same Title,

Experiment 5.

THe figuration of the Volatile Salt of Humane Blood may be considered, either in regard of the Single Grains, or of that Aggregate of them, which when they are made to ascend to the top of the Glass, may be called its *Sublimate*. The latter of these may be best observed, when the Saline Exhalations first ascend, and fasten themselves to the inside
of

of the blind head, or other Glass that is set to receive them. For, though towards the end of the Operation the Corpuscles lye so thick and confus'd, as to leave no distinct figures, yet at first one may often observe the little Saline concretions to lye in Rows, sometimes straight enough, and sometimes more or less crooked, with differing Coherencies and Interferings, so that though sometimes these Rows of concretions may, especially if a little befriended by the Spectators fancy, represent either Trees, or their Branches, or Harts-horn, &c. yet these seem not to be constant Representations, depending upon the particular Nature of Humane Blood, but casual figurations that depend upon several accidental causes and circumstances, such as the degree of Fire employ'd to sublime the Salt, the plenty or paucity of the ascending Matter the capacity and figure of the vessel that receives it, besides several others not needful to be here enumerated.

enumerated. Nor is the Salt of *Humane Blood* the only Volatile one, among whose elevated concretions I have observed the above named Circumstances to produce diversity of Configurations. But as to single grains of the Volatile Salt of Blood, I discerned a good many of them to be finely shap'd. But whether it were accidental or not, further Tryal must inform me. I could not, that I remember, observe these handson Figures in the concretions that compos'd the Sublimate; that was obtained by rectifying or elevating again the Salt that first came over, but in the grains that in the first Distillation fasten themselves to the upper part and sides of the Receiver; For of these divers were of considerable bigness and solidity, and *though* they were not all of the same shape, some of them being not unlike to *Cubes*, others to *Parallelopipeds*, others to *Octoedrons*, being almost like Grains of Alum; yet most of them
were

46 *The Natural History*

were prettily shaped, being comprehended by Planes smooth, finely figur'd, and aptly terminating in solid Angles, as if the Concretions had been cut and polished by a Jeweller.

To the same Title,

Experiment 6.

THere is another way that I have used to observe the Figures of the Salt of Blood which was to rectify the Spirit of Blood, so as it may be fully satiated with the Salt, whilst the Liquor (in the Receiver) continued yet somewhat warm. For then setting aside this over impregnated Liquor when it came to be quite refrigerated (which should be done very slowly) there appear'd at the bottom of the Vial a good number of Saline concretions of differing Sizes,

Sizes, several of which, as far as the rest would suffer me to see them, were shot into CrySTALLINE Plates very smooth, and prettily figur'd, having to the best of my conjecture, their broad and parallel Surfaces of a Hexagonal or an Octogonal Figure regular enough.

To the same Title,

Experiment 7.

ACcording to the *Hypothesis* of divers Learned Naturalists and Physicians, I suppos'd it would be thought considerable, to know what would happen upon putting together the Volatile Salt of Humane Blood, and the Spirit of Nitre, with the more fugitive parts of which Salt they conceive the Air to be plentifully, and some of them to be vitally impregnated.

To

To gratify some of these Philosophers, we took a dram of dry Volatile Salt of Blood, (which we made choice of, rather than Spirit, because we had a mind to know what quantity of Acid Salt it would retain ;) and having dissolv'd it in some distill'd Water, we drop'd into it good Spirit of Nitre, till the two Liquors, tho' they were shaken, would no longer manifestly act upon one another; the Conflict being ceas'd, we slowly evaporated the superfluous moisture, which steam'd almost all away before the Saline part would coagulate. At length it came to driness, and then the middlemost part appear'd in the form of thin Crystals, not unlike those of Salt Petre; but the rest, which was by much the greater part of the concretion seem'd to be a confus'd mass without any distinct figure. This mass weigh'd but 12 gr. more than a dram. So that as far as this single Experiment can inform us, the Volatile

tile Salt of Blood may be satiated by so little as a Fifth part of its weight of the Saline Corpuscles of Spirit of Nitre. This compounded Salt being laid in a Window, did appear to be very prone to be resolv'd by the moisture of the Air, or in the Chymists Phrase to run *per deliquium*. A little of the same Salt being put upon a well-kindled Coal, readily melted, and seem'd to boil, and towards the latter end, made a noise, and afforded a flame very like common Nitre, save that its colour was more yellow. The strong smell that accompanied this deflagration, was like that which is peculiar to Spirit of Nitre.

E

To

To the XXI. Title
OF THE
HISTORY,

Experiment 1.

HUmane Blood, as most of the other Subjects of the Animal Kingdom that I have had occasion to examine, afforded by Distillation in a Retort an Empyreumatical and very fetid Oyl, whose colour was almost black ; but that seem'd to me to proceed only from the intense and opacous Redness of the Liquor, since some Portions of it being purposely look'd on against the Light, when they were spread very thin upon Glass, appear'd of a deep yellow, or of a Reddish colour, as they chanc'd to lye more or less thick upon the Glass.

Ex-

Experiment 2.

WHen the Blood was well dry'd, before it was committed to Distillation, I found it to afford a greater quantity of Oyl, in proportion to the weight of the dry Body, than was at first expected. Once out of a pound of not over-well dry'd Blood, we had near an ounce and a half of Oil; and from another parcel we had it in a far greater proportion to the quantity of Blood that afforded it.

Experiment 3.

I Remember, that having many years ago had the curiosity to prepare Blood by a very convenient Digestion, and to rectifie very carefully

fully the Distill'd Liquors that came over, with the Flame of a Lamp, I obtain'd among other things two Oyls of very differing colours, the one being of a Yellow or pale Amber colour, and the other of a deep Red. But that which surpriz'd even ingenious Spectators, was, that tho' these Oils were both of them afforded by the same Blood, and were clear and pure enough, yet they would not only swim in distinct Masses one over another, but if they were confounded by being shaken together, would little by little separate again, as common Oil and Water are wont to do. Whether the difference in Specifick Gravity between these two Oils could keep them from permanently mixing, when they were mingled, as well as it kept their Masses distinct before they were shaken; or whether this seeming Antipathy proceeded from some particular Incongruity in the Textures of these Liquors, I shall not now stay to dispute.

Experiment

Experiment 4.

IT may be of some use, especially to those that aim at making Medicinal uses of Humane Blood, to know, that having had a suspicion that the Oil of Blood might contain or conceal divers Saline Particles, capable of being separated from it ; we took a parcel of unrectifi'd Oil, and having put to it a convenient quantity of Distill'd Water (I suppose Rain-water would have done as well, tho' common Water would not) we diligently confounded these Liquors by frequent agitation, that the Water might rob the Oil of its separable Saline Corpuscles. Of which Trial the Event was, that after the Liquors were well settled, the Water (whereof we purposely forbore to employ too much) was found impregnated with Saline Corpuscles,

54 *The Natural History*

that it had by dissolution obtain'd from the Oil, by vertue of which it was endowed with a moderately brisk tast, and would readily turn Syrup of Violets green, and precipitate out of a Solution of common Sublimate a white Powder, to name now no other of its resemblances to weak Spirit of Humane Blood. And this operation I the more willingly relate on this occasion, that you may be invited to try what the like Method will do on other Empyreumatical Oils, as of Hartshorn, Urine, &c. drawn from Bodys that belong to the Animal Kingdom.

Experiment 5.

TO examine a Conjecture, whose Grounds I cannot stay to set down, we put some unrectified Oil of Humane Blood into a concave piece of Glas, and then having dropt

dropt into it as much Oil of Vitriol as might by guess amount to a fourth or third part of the Fetid Oil, we stirr'd them well together with a slender piece of solid Glass, by which means the mixture was made to send up good store of whitish Fumes or Smoke, and grew, as was expected, considerably hot, it being indeed so hot, that tho' it amounted not to above a spoonful, yet I was not able without pain & inconvenience, to hold my finger underneath that part of the Glass that contain'd the incalcent Liquors.

Experiment 6.

IT may be worth while to relate, that what I have elsewhere observ'd about some other Empyreumatical Oils, holds true in that of Humane Blood: For having taken some of this Liquor unrectifi'd, tho' in

56 *The Natural History*

that state it appear'd gross, and dark, and muddy, yet it would readily, even in the cold, dissolve in, or mingle with highly rectifi'd Vinous Spirits, to which it communicated a Reddish colour deep enough, agreeably to what I formerly noted touching the colour of this Oil.

To the XXII. Title

OF THE

HISTORY.

I do not remember to have met with, in any Author, an account of the Qualities of the fix'd Salt of Humane Blood, and I know not whether any have had the curiosity to prepare it, whereat I do not much wonder, since to obtain so much as 3j. Of it there is requisite a considerable

ble quantity, perhaps some pounds of Blood, and the Calcination requires so obstinate a fire, that a mans patience may easily be tired before the Operation be perfected, or by the small appearance of Calcination that the Caput Mortuum will afford him after having been kept Three or Four hours in the fire, he may be induc'd to conclude that all the Salt of Blood is volatile in a good Fire, and consequently, that it will yield no fix'd Salt.

But having by an obstinate Calcination obtain'd between Three or Four Drams of this Salt, I found not that it was a fix'd Alcaly or a Lixivate Salt, but rather as I expected, of the nature of common or Sea Salt, tho not without some little diversity which discover'd itself by some nice Tryals. But as to the main our Salt was scarce distinguishable from marin Salt, for it tasted very like it, a strong Solution of it did not readily (for I was not at leisure to wait long

long for the Event) turn Syrup of Violets green or greenish, nor (which was more) Precipitate a Brick Colour or brownish Yellow, no more than a white Powder, out of Solution of Sublimate. I also found by Tryal that the Spirit of Salt did not dissolve it as an Alcaly. And to these ways of examining it I added three others, that I had not known us'd for such a purpose, and which had all three of them such Events as were expected, for having put some Oyl of Vitriol upon a little of our dry Salt, it did immediately, as I had divers times observ'd it to do upon common Salt, corrode it with great violence, and with much foam and smoak. We also drop'd a little of our fix't Salt dissolved in distilled water, upon a Solution of fine Silver made in *Aqua Fortis*, whereupon immediately ensued a Precipitation of a copious white Powder. And lastly for further Tryal, having put some leaf Gold into *Aqua fortis*, which would not (as will easily be believ'd)

of *Humane Blood*. 59

believ'd) work upon it, whilst it was swimming there without being so much as discolour'd, I put a little of our Powder'd Salt into the Liquor, which being thereby turned into a kind of *Aqua Regia*, did in a trice, without the assistance of heat, totally dissolve it.

To the XXIII. Title

OF THE
HISTORY
OF

Humane Blood.

There is a far greater Calcination than one would expect, required to obtain the *Caput Mortuum* of

60 *The Natural History*

of Humane Blood, which affords but very little of it. For from xxxiv. of dry'd Blood, (which perhaps was but the Third or Fourth part, in weight of the entire Blood that afforded it) we could get after two days Calcination but 3ij.9 gr. of Earth. And though this were so carefully made that it may very probably be supposed to deserve the name of *Terra Damnata*, better then most substances to which Chymists are wont to give that appellation, yet one may suspect, that this it self was not pure Elementary earth, since it had a red colour, very like that of Colcotar of Vitriol.

The

To the XXIV. Title
OF THE
HISTORY.

THe Quantities of the *Principles*,
or rather of the Several *differ-*
ing Substances, obtain'd by Distilla-
tion from Humane Blood, may seem
easy, but is indeed very difficult, if at
all possible, to be determin'd not only
because of the sometimes great dis-
parity, as to proportion, that may be
met with of the Fibrous, or con-
creted part to the *Serum*, in the
Blood of differing Persons, and even
of the same Person according to dis-
fering Circumstances, but also, be-
cause it is more difficult to distill e-
ven the dried and pulverable part of
Blood without addition, than those
that

that have not try'd, will easily judge, and I doubt that few have try'd it well, because I have not met with any that takes notice of the necessity of shifting the Retort, to gain as much Volatile Substance as may be obtain'd, and leave as little as may be in the *Caput Mortuum*. For when we distill'd a somewhat considerable quantity of dry'd Blood, though it was warily done by an expert Artist, yet the same heat, that made the lower part of the Blood pass in the form of Exhalations into the Receiver, made the matter so swell, that it heav'd up to the upper part of the vessel a considerable quantity of Black Matter, which an ordinary Distiller would have taken and thrown aside for *Caput Mortuum*, but which an heedful Eye might easily discern to be much of the same nature with what it was, when it was first put in, though it were blackened by the ascending fumes. Wherefore we took it out and mixing it with the remain-
ing

ing Substance, that was less remote from the Nature of a true *Caput Mortuum*, it was again in another Retort committed to Distillation, whereby we obtain'd more Oyl, &c. And perceiving that even this seeming *Caput Mortuum*, had at the top of it a pretty deal of matter, that I did not think sufficiently dispirited, if I may so speak, I caused it to be taken out and distill'd in a fresh Retort, in which it afforded a not contemptible quantity of Volatile matter.

Having thus prepar'd you not to expect any thing of accurateness, in the determination of the Quantities of the differing substances obtainable even from dryed Humane Blood, that I may assist you to make some guess at it, that may approach somewhat near the truth, I will inform you, That having thus in three Retorts distill'd 24 Ounces of dryed Humane Blood, we obtained of Volatile Substances, I mean Spirit together with a little Phlegm, white Salt, and
very

64 *The Natural History*

very high coloured Oyl 3xiiij. and a dram, besides several parcels of thick Oyl, that stuck to the Retorts and the Receiver, which we estimated at Seven drams more. So that the whole quantity of the Volatile part amounted to Fourteen Ounces, of which we found the Oyl to be about 3iiij. + 3vj. And the clear Liquor (which though probably not without some Phlegm, may deserve the name of Spirit, because it was fully satiated with Saline and Spirituous parts) to be 3vi + 3iiijss. besides the Volatile Salt, which when the Spirit was drain'd from it, appear'd white, but wet; for which reason 'twas not possible to determine exactly, neither how much Liquor it yet retain'd, nor consequently how much it self weighed but you may guess pretty near the truth when I shall have told you, that having carefully sublim'd the Salt, there remain'd in the glass 3ij and about five grains of Phlegmatick Liquor, which was not judged devoid of

of Salt, tho it could not by that operation be separated. And of Volatile Salt in a dry form we obtain'd $\text{zj} + \text{zjss}$. The *Caput Mortuum* amounted to zviii , and somewhat better, which being calcin'd for two days together, afforded not white, but only brownish red Ashes; whence we obtain'd zvij and a

Of this Salt see the Notes refer'd to the 22d Title.

quarter of White and Fixt, but not truly Lixivate, Salt, and (as was lately noted to another purpose, under the next foregoing Title) zij , and nine grains of Earth. In this troublesome Experiment there occur'd so many necessary Operations, in each of which we could scarce possibly avoid losing some, and now and then a considerable portion of the matters we handled, that if you had been present at the Tryals, perhaps you would not think it strange that I should write, (as I did a little above) that I think it a very difficult thing in Practice, to deter-

F

mine

mine exactly the Proportions of the differing Substances, that may be chymically obtain'd by vulgarly known Operations, from a proposed parcel of Humane Blood ; especially since I think that 'tis without sufficient grounds that Chymists do universally take it for granted, that in Distillations carefully made, the matter that passes into the Receiver, or at least ascends, together with the Remains, or *Caput Mortuum*, amount to just the weight that the entire Body had before Distillation. Which Paradox I endeavour to make highly probable, if not certain, in another Paper, that belongs not to the present Collection.

The

The Third Part,

Containing Promiscuous Experiments
and Observations about the Se-
rum of healthy Mans Blood;

(Whereof the first may be referr'd to
the Sixteenth, and most of the rest
to the Seventeenth of the Titles of
the first Order.)

Since the Division that Nature her
self makes of Humane Blood,
when being let out of the Veins, it
is suffer'd to refrigerate and settle, is,
into a *fluid* or *Serous*, and a *consistent*
or *Fibrous* part; and since 'tis found
that oftentimes the former of these
Parts either equals or exceeds the
latter in quantity; I thought it might
probably much conduce to the bet-
ter discovery of the Nature of the

Blood, to make some Tryals upon the *Serum* by it self, of which it will not, I hope, be useles to give a summary account in the following promiscuous Observations, that were made only upon the *Serum*, or Whey of the Blood of Persons presum'd to be sound.

1. Having separately weighed the *Serum*, and the Consistent Part of a parcel of Humane Blood, obtained at once by a single Phlebotomy, we found the latter to weigh $\text{z}iv + \text{z}viss.$ and the former $\text{z}iiij + \text{z}vj.$ And having made the like Tryal with another parcel of Blood drawn from another person, the Fibrous part weighed $\text{z}iv + \text{z}v,$ and the *Serum* four ounces. But tho' in both these Tryals the weight of *Serum* that appear'd in one Mass, was inferiour to that of the Fibrous Part, yet it would not be safely inferr'd, that, absolutely speaking, the Fibrous part of either of these parcels of Blood exceeded the other, since we weighed only the *Serum*
that

that we found in a distinct Mass; whereas a multitude of Serous Particles may well be suppos'd to be lodg'd between the Parts of the Consistent Mass or Portion of the Blood; since besides that it is, probably upon the account of the Interspersed Serosity, very soft, it affords a great deal of Aqueous Liquor.

2. This may sufficiently appear by the following Experiment, which was purposely made to examine this Conjecture.

We took a Porringer of Blood, wherein the *Serum* was separated from the *Fibrous* Portion, that was coagulated into one Consistent Mass, and having carefully pour'd off all the fluid part, we put the remaining Mass, (which weighed $\text{z}iv. + 3 \text{ v} + 34 \text{ gr.}$) into a small Head and Body, and distill'd it in the Digestive Furnace, till the Matter left in the bottom of the Cucurbite was quite dry, which it did appear to be long before it was so indeed. Then taking

out the separated Parts of this Red Mass, the dry'd Portion was found to weigh but $3j + 3iij + 34gr.$ whereas the Serous Liquor that pass'd into the Receiver, and was limpid and aqueous, without any shew of Salt or Oyl, amounted to $3iij + 53gr.$

For further satisfaction we repeated this Experiment with the Fibrous part of another parcel of Humane Blood, and found the dry Mass remaining in the Cucurbite to weigh but $3j + 3vj + 50gr.$ whereas the Phlegmatick Liquor distill'd from it amounted to $3vij$, that is to more than three times and a half as much as the dry part.

3. Having Hydrostatically examin'd the *Serum* of Humane Blood, we found it heavier than common Water. For a piece of Red Sealing-Wax, being suspended in a good Ballance by a Horse-hair, was found in the Air to weigh $3j + 56gr.$ and the Water $35gr.$ but did in the *Serum* weigh but $33gr.$

This

This Tryal was confirm'd by a more exact one, made with an Instrument that I purposely caus'd to be made for weighing Liquors nicely, in which, when Common Water weighed 253 grains, an equal bulk of *Serum* weighed 302. And because I suppos'd that all *Serums* of Humane Blood would not be of equal Specific Gravity, I thought fit to try that of the Blood of another person in the same Instrument, and found it to weigh two grains less, that is, 300 grains in all.

4. We once employ'd some *Serum* that could not be (or at least was not) pour'd off so clear, but that it appear'd of a reddish colour; and tho' we filter'd it through Cap-paper, yet a good number of the tinging Corpuscles were so thoroughly mingled with it, that the Liquor pass'd through the Filtre of a Yellow Colour.

5. To try whether Acids would coagulate our *Serum*, as I had found they would some other Animal Li-

quors, I dropt into it some Spirit of Salt, which did immediately produce with it some white Concretions that quickly subsided to the bottom, and there (when there was a pretty quantity of them) appear'd like a very light and tender Cheese-Curd.

The like Operation, but more powerful had Oyl of Vitriol upon another parcel of our *Serum*.

6. We dropt into some of our Liquor, good Spirit of Sal-Armoniac, which, as we expected, rather made it more Fluid, than did appear to coagulate it, as the Acid Liquors had done.

7. To try whether these Precipitations did not more proceed from the Coalition and Texture of the Acid Salts and the *Serum*, than barely from the peculiar action of those Salts as Acids, we dropt into another portion of our *Serum*, a strong Alkalifate Salt, viz. Oyl of Tartar *per deliquium*, which instantly produc'd a White Curd, as the Spirit of Salt had

had done, but not, as it seem'd to us, so copiously.

8. We pour'd also upon some *Serum*, highly rectifi'd Spirit of Wine, which, as we expected, did presently coagulate some part of it into a White Curd, that was copious enough, but appear'd much lighter than either of the former, since it would not like them subside, but kept at the top of the Liquor.

9. To try also what a Salt compounded with a Metal, would do upon our *Serum*, we put to it a little strong Solution of Sublimate, with which it presently afforded a white and curdled substance.

We put some of our *Serum* upon some Filings of *Mars*, but by reason of the colour of the Liquor it self, we could not satisfy our selves about the Event. And thô we afterwards put another parcel of *Serum* upon Filings of the same Metal, yet neither did this give us satisfaction, in regard the Vial having been mislaid,

mislaide, was not look'd upon again till many days after; at which time the Liquor was grown so thick and muddy, that we could not well discern any more of the colour, than that it was somewhat dark, but not either black or blackish; yet by a Tryal or two that we made with a little of this Liquor, it seem'd to have made a Solution of some part of the Steel: For putting it to some fresh Infusion of Galls made with Water, it presently afforded a copious Precipitate; but this was so far from being Inky, that it was not so much as dark colour'd, but rather whitish; at which some analogous Experiments (mentioned in another Treatise) that I formerly made, kept me from wondering. Yet I shall not omit to add on this occasion, that having mix'd with some of our impregnated Serum, a convenient quantity of Infusion of Galls made in a highly rectifi'd Vinous Spirit, the two Liquors did not
only

only afford a kind of *Coagulum*, or Precipitate, but being left together for some hours, associated into a Consistent Body, wherein the Eye discover'd no distinct Liquor at all.

10. But expecting more clear success, by putting some of our Liquor upon Filings of Copper, which when wrought upon by Bodys that have in them any thing of Urinous Salt, are wont to give a conspicuous Tincture, we accordingly found that the Metal had in a very few hours discolour'd the *Menstruum*; and afterwards (the Vial being left unstopt, that the Air might have Access to the Liquor) it began by degrees to grow more and more Blew, and within a day after was of a deep Ceruleous Colour.

11. And, to be confirm'd in our Conjecture, that this Tincture proceeded from some Particles of Volatile Salt latent in the Liquor, we mix'd some of it with a convenient quantity of Syrup of Violets, and thereby

76 *The Natural History*

thereby obtain'd what we look'd for, namely, a colour, which by reason of the action of those Particles upon the Syrup, appear'd of a fine Green.

12. The Blew Tincture or Solution of Copper (mention'd number the 10th) I thought fit to keep for some time, to try whether the Metal-line Particles would as it were embalm the *Serum* they were dispers'd through, and preserve the Liquor from Putrefaction. And in Effect, tho the Vial was left unstopt in a window in my Bed-Chamber for many weeks, yet I (whose Organs of smelling are very tender, and who did often put the Vial to my Nose) did not perceive the Liquor to grow at all stinking.

13. About 3ij, by gues of *Serum* of Humane Blood were left in an unstop'd vial, (which they more then half fill'd) for Twenty days or Three weeks and though the Glass usually stood in a South Window, and in the month of *July*, yet, somewhat

to

to our wonder, the *Serum* did not by the smell appear putrefy'd, and yet had let fall a considerable quantity of Whitish Sediment. But within Three or Four days after this, the Liquor was found to stink offensively. Wherefore we tryed whether this more then incipient Putrefaction was accompanied with any Acidity, but could not perceive that it was, since it would not so much as take off the blew colour of the infusion of *Lignum Nephriticum* or our *Succedaneum* to it. When it was in this state we put it to distill in a low Cucurbite with a gentle fire, to try if from this fætid Liquor, as is usual from putrefy'd Urine, the Spirit would first ascend. But we found the Liquor that first came over to be so little Spirituous or Saline, that it would not in an hours time turn Syrup of Violets green. But yet we judg'd it not quite destitute of Volatile Alcaly, because having let fell some of it into a good solution of Sublimate, it presently made at White Precipitate.

14. We

78 *The Natural History*

14. We took some Ounces of *Serum* of Humane Blood, filtered through Cap Paper to free it from all concreted Substance, and having committed it to Distillation in a small Retort plac'd in a Sand Furnace, we obtained only a few large drops of a Darkish red Oyl, some of which subsided to the bottom of the other Liquor, but the greater part swam upon it. We obtain'd in this first Distillation no Volatile Salt in a dry form, but after a pretty deal of insipid Phlegm had been drawn off, there came over a good proportion of Spirituous Liquor, which smell'd almost like the Spirit of Blood; and contain'd a pretty deal of Volatile Alcaly, so that it would readily turn Syrup of Violets Green, and make a White Precipitate in the solution of Sublimate, and a great Ebullition with Spirit of Salt : This Spirit being rectified in a small Head and Body, there was left in the bottom of the Glass a greater quantity than was expected

pected of a substance thick like Honey, and which was for the most part of a dark Red, and seem'd to contain more Oyl than appeared upon the first Distillation. The Liquor that came over the Helm, seem'd more pure, but not very much stronger. than the first Spirit. Yet, having put it into a Glafs Egg with a slender neck, and given the vessel a convenient situation in hot Sand, we obtain'd a Volatile Alcaly that sublim'd into the neck in the form of a White Salr. If this Tryal be reiterated with a success like that I have now recited, 'twill seem to argue that the *Serous* or *Fluid* part of the Blood affords the same Elementary Principles or Similar Substances, both as to *number* and *kind*, that the *Fibrous* and *Consistent* part does, though not as to *quantity*, that of the Oyl and dry Salt being less in a determinate portion of *Serum*, than they would be in a like quantity or weight of the concretioned part of the Blood.

Having

Having long since observ'd, that *though* the Spirituous parts of Mans Urine are wont to require that the Liquor be digested or putrefy'd about Six weeks, to loosen them from the more sluggish parts, and make them ascend before the Phlegm, yet if fresh Urine be pour'd upon a due proportion of Quick-lime, a good part of the Spirit will presently be untyed, and made capable of ascending in Distillation, I thought it worth while to try, what would be afforded by the *Serum* of Humane Blood if it were put upon Quick-lime, before we distill'd it. Inpursuit of this Enquiry, we put these two Bodies together, upon whose commixture there ensued (but not presently) a sensible but transient heat. This compounded Body being committed to distillation afforded first a kind of Phlegm in a gentle fire, and then in a stronger, a moderate quantity of Liquor that was thought to smell manifestly of the Lime, but had not

a brisk tast. This was accompany'd with somewhat more of high coloured & fatid Oil than was expected. The other Liquor being slowly rectify'd, the Spirit that first came over had a strong and piercing smell, but less rank than that of Humane Blood drawn the ordinary way. Its tast also was not only quick, but somewhat fiery. Being dropt upon Syrup of Violets, it presently turn'd it green, with a strong Solution of Sublimate in Water, and another of Quick-silver in *Aqua Fortis*, it immediately made two White Precipitates. And being mingled with some good Spirit of Sea-Salt though upon their being confounded there appear'd a thick but whitish Smoke, there was not produc'd any visible conflict or Bubbles. Yet the Colour of the Spirit of Salt, appear'd much heightn'd by this Operation. But here I must, though not in due place, take notice, that having put the lately mentioned mixture of the Spirit of *Serum* and of Salt to
G
evaporate,

vaporate, that we might observe whether it would afford a Salt much figur'd like Sal-armoniac; we found, that it did not, but that the Colour produc'd in the Mixture whilst fluid, was so heightned in the concretion we speak of, that it appeared of a Blood-red Colour, but for the shape, it was so confus'd, that we could not reduce it to any known kind of Salt. By all which *Phænomena* this Spirit of the *Serous* part of Blood, seems to be very near of kin to that of the *concreted* part of Blood, elsewhere by us described. Because Quick-lime is wont to be suspected by Physicians, by reason of its Caustick and Fretting Quality, I thought fit to try whether the Fixt Salt of Pot ashes (which is a Lixivate Alcaly as well as Lime,) being substituted in the Room of it, would in Distillation have the same Effect upon *Serum* of Humane Blood. Wherefore to Four parts of the Liquor, we put one of the Salt, and having Distill'd them slowly in a Glass Head

Head and Body, we obtain'd good store of a Liquor, which was not judg'd any thing near so strong, as that formerly mention'd to have been drawn off from Quick-lime. And having put this weak Liquor, afforded by our *Serum*, to rectify with a gentle heat, we found that even the two spoonfuls of Liquor that first ascended, were not Spirituous, but very Phlegmatick. Nor would it well turn Syrup of Violets Green, though it afforded some little and light Precipitate, when it was put upon a Solution of Sublimate.

This may seem somewhat the more remarkable, if I add on this occasion an Experiment, that may be sometimes of Practical use, especially in Physick, and may afford much Light to those that are studious, to know the Nature and Preparations of so very useful a Subject, as *Humane Urine*. We took three parts of fresh Urine, (that was not many hours old) and having put into it one

part of Salt of Pot-ashes, (because that was at hand, for else I presume the fixt Salt of Tartar, or even of Common Wood ashes, would have served the turn) and having slowly distill'd them in a Head and Body, there first ascended a Liquor Spirituous enough; which being set aside, We continued the Distillation (after having poured the Mixture into a Retort) till the Remains appeared dry. In this operation it is to be noted; that we obtain'd not one drop of Oyl; and that (perhaps for that reason) this Spirit of Urine was not near so fætid, as being made the Common way 'tis wont to be: and that the Liquor that came over toward the latter end of the Distillation, was so unlike that which the *Serum* of Blood afforded us, that it was not only considerably strong, and manifestly stronger than that which first ascended, but had a penetrating and fiery Taste, which left a lasting Impression upon the Tongue; and

and with good Spirit of Salt made a notable Ebullition, which I remember not, that upon Tryals purposely made, I found the Spirit of Urine drawn from Quicklime to have done. And, whereas with this last mentioned Liquor, I never (that I remember) found any Volatile Salt to ascend (in a dry form) in the operation made by the help of Salt of Potashes, there came up without Rectification, divers Grains of Volatile Salt, one of which was CrySTALLINE, and considerably large; so that we could with pleasure observe it to be like a Plate curiously figur'd; But because of some lesser Corns of Salt, that hid one part of it, I could not clearly discern whether it were Hexagonal or Octogonal.

But here I must not conceal, that having for greater certainty reiterated this Experiment, it had not so good success; the Liquor that came over appearing much more Phlegmatick, than that which the former Tryal afford-

ed us ; tho we both times employ'd Salt of Pot-ashes taken out of the same Vessel, and the Urine of the same Person. So that what the reason of the difference may be, does not yet occur to me ; but perhaps will upon further Tryals: yet this Liquor, that appear'd so weak at its first coming over, being rectified *per se*, afforded more than was expected of a Brisk Saline Spirit, from which we easily obtain'd a pretty quantity (in proportion to the Liquor) of Volatile Salt in a dry form, and of a very White Colour.

We took between two and three Ounces of *Serum* of Humane Blood, and having put it into a Bolt-head, capable by our guess of containing about four times as much Liquor, and having seal'd the Glass Hermetically, set it by, as well to observe whether any manifest Changes would appear in it within a Week or two, (of which none in that time occur'd to us) as for some other Purposes, that may be guessed

guess'd at by the following Account of the Event.

1. After we had kept the Liquor seal'd up above a whole Year, it did not appear to be at all coagulated, nor to have let fall any manifest Residence ; but seem'd to be as fluid as when it was first put in.

2. It did not appear to have bred any the least Worm or Maggot. And this I the rather take notice of , because it agrees very well with what I have elsewhere alledg'd, in disfavoured of their Opinion, that think, all the fluid and soft Parts of Humane Bodies do naturally, and of themselves, in no long time breed Worms, or some such Insects ; which, for my part, I never observ'd to be generated in Blood it self, though very long kept, and putrified, provided it were fresh enough when put into the Glass, and by an exact Closure kept from being any way blown upon by Flies, or impregnated by Seminal Particles, that may be unsuspected-

ly convey'd to it by the Air.

3. Nor did there appear to the Eye any *Mother*, as they call it, or Recrementitious Substance, that is suppos'd in Liquors always to accompany, and betoken Putrefaction.

4. One of my Designs, in our Experiment, being to try whether the *Serum* would, by the mutual Action of the Parts upon one another, or by that of some Catholick, permeating Fluid, afford so much Air as would either crack, or more violently break the Glass; the Tip at which the Bolt-head was seal'd, was warily taken off with a Key, whereupon there rush'd out a pretty deal of Air, with a considerable noise: And I doubted not that this generated (or at least extricated) Air, had been considerably compress'd whilst it was pent up; when casting my Eyes on the Liquor, to discover what change this Eruption had made there, I perceiv'd on the upper Surface of the Liquor a multitude of small Bubbles, such

such as are wont to be seen in Drink a little Bottled, upon the opening of the Vessel ; and also in divers Liquors, after the Air has been pent up with them, when the Glasses come to be unstopp'd. And I also the less wonder'd at this, because I remember'd what formerly hapned to me, after having seal'd up some Sheeps Blood, and kept it for several Days in a gentle warmth ; for, tho the Glass it was enclos'd in, were far larger than this that contained our *Serum* ; yet after some time, when no Body offer'd any violence to it, or was near enough to stir it, it was suddenly blown up with a surprizing noise by the Aereal or Elastical Corpuscles that were produced, or set free by the Putrefaction we discover'd to have been made.

5. The smell of our *Serum* was strong, but not Cadaverous, but rather resembled that of the Tincture of Sulphur made with Salt of Tartar and Spirit of Wine, or of some such
Sul-

Sulphureous Preparation.

6. One of the chief aims I had in keeping our *Serum* so long Seal'd up, was to try, whether by a Digestion, or Putrefaction for some Months, the *Serum* of Blood would like Urine (which is commonly thought to be a Liquor made of it, and of very near Cognation to it) afford a Saline Spirit, or an Alcaly Volatile enough to ascend before the Phlegm. And in pursuit of this enquiry we committed our *Serum* to Distillation in a small Glass Head and Body, and in a Digestive Furnace, being careful to take the first Spoonful, or thereabouts of Spirit that passed into the Receiver: But we found, that, tho this Liquor at first smell'd strong enough, (I say at first, because the Odour soon after grew fainter) yet the tast was not at all brisk nor Spirituous like that wont to be obtain'd by Distillation from Putrify'd Urine. Nor did our Liquor being drop'd into a little Syrup of Violets, give it presently

sently any manifest greenness. But yet, because I found it not insipid, I thought fit to examine it a little more critically, and dropt a convenient quantity of it into a clear and Saturate Solution of Sublimate in Common Water, by which means there was produc'd a whiteness like that (but not near so dense) which Spirit of Urine, or Volatile Salt would have produc'd. And by this I was invited to mix some of it with a little Syrup of Violets upon a piece of White Paper, and also to wet with the same (Distill'd) Liquor, some small filings of Copper spread upon another piece of Paper, and to leave them both all Night in the open Air, that the Liquor might have time enough to work upon the Syrup, and the Metal. By which course we found in the Morning, that the former was turn'd green, and the latter was so far dissolv'd as to leave a large blewish stain upon the Paper. I mention these things the rather, be-

because according to the Opinion of some Learned Men, this degenerated *Serum* should have been of an Acid, not an Alcalisate nature.

7. The near Cognation that, according to some Learned Physicians, there is between Milk, and the more Serous part of the Blood, invited me to try whether, (according to an Experiment made on New Milk, that I have heard ascribed to the famous *Sylvius*,) our *Serum* of Humane Blood would grow Red, by being kept continually stirring over a moderate heat with a competent quantity of Salt of Tartar, but in two tryals, we found not any redness produc'd, tho one of them was made in a Vessel of refin'd Silver, with an eighth part of the Salt in reference to the *Serum*, which was the same proportion that we had us'd when we made the Experiment succeed well in Milk.

8. Perhaps it will be needless to take notice, that the *Serum* of Humane

mane Blood will by heat be in a short time coagulated into a kind of Gelly, or rather, as far as I have observ'd, into a Substance like a Custard, as to Consistence, tho not as to Colour. And therefore I shall now add, that having found that Acid Spirits also would coagulate *Serum*. I thought fit to try, whether Alcalys would not oppose, or retard its Coagulation. Of which Tryal the event was, that having put Spirit of Humane Blood to a convenient quantity of *Serum*, and caus'd them to be kept stirring over a very gentle Fire, though the Volatile Alcalys did not hinder the Coagulation, yet it seem'd to make it both more slow, and more soft or laxe. And this effect was yet more considerable, when we try'd another parcel of *Serum* with Salt of Tartar instead of Spirit of Blood.

The

The Fourth Part,

*Containing the History of the Spirit
of Humane Blood Begun ;*

*In an Epistolary Discourse to the very
Learned Dr. J. L.*

Sir,

HAVING by want of leisure and opportunity, been reduced to treat of the History of Humane Blood in so imperfect and desultory a way, that several of the Titles have been left wholly untouch'd, and others have been but transiently and jejune treated of; I thought fit to handle more fully, some one of the Primary Titles, and branch it into its several subordinate or secondary Titles. And for this purpose I pitch'd upon the Spirit of Humane Blood,

Blood, being willing on so noble a Subject to give a *Specimen* of what might have been done to Illustrate the other Primary Titles, if some requisites had not been wanting. And since the Spirit of Humane Blood is at least one of the noblest of Urinous or Volatile Alcalies; so that most of the things that shall be taught concerning that, may with some little variation be apply'd to Spirit of Urine, Hartshorn, Sal Armoniac, Soot, &c. I thought fit to lay down a Scheme of subordinate Titles, whose Heads (which amount to above half the number of the Primary ones, that belong to the whole History of Blood) should be so numerous and comprehensive, that this Paper may pass not only for an Example, but for a kind of summary of the History of Volatile Salts in general, and so supply the loss of a Paper that I once begun on that Subject.

And now I should without further
Preamble

Preamble proceed to the intended History, but that I think it requisite to premise three or four short Advertisements. Whereof the First shall be, That the Spirit I employ'd in making the following Tryals and Observations, was drawn from Humane Blood without any Sand, Clay, or other Additament, (save perhaps that by a mistake that could do no mischief, a small parcel had some Vinous Spirit put to it to preserve it a while) and that the first distillations (which I so call to distinguish them from Rectifications) were perform'd in Retorts plac'd in Sand, (and not with a naked Fire) care being taken that the Vessels were not too much fill'd because Blood, N. B. if it be not well dry'd, is apt to swell much, and pass into the Neck of the Retort, if not into the Receiver.

Secondly, I desire to give notice, that the Blood we made use of, was drawn from Persons that parted with it out of custom, or for prevention,
which

which was the main reason why I was so scantily furnished with Blood, that of sound persons being in the place I resided in, very difficult to be procur'd in quantity, and that of sick persons being unfit for my purpose.

Thirdly, It may not be amiss for obviating of some Scruples, to advertise that, there being so great a Cognation between the Spirit and Volatile Salt of Humane Blood, that, as we shall see anon, 'tis probable that the latter is little other than the Spirit in a dry form, and the former than the Salt united with Phlegm enough to give it a Liquid form; 'tis presum'd that it may be allowable to consider the Volatile Salt of Blood as its dry Spirit.

Lastly, To the three foregoing, 'twill be fit to add this Fourth Advertisement, That tho, in comparison of the Particulars thrown in to the Second and Third Part of those Memoirs, the ensuing Fourth Part is

H metho-

methodically written, yet you are not to expect to find in the Method any thing of Accurateness; since the Experiments and Observations whereof this Fourth Part consists, were written in loose Papers, at distant times and on differing occasions, and because of this and of my haste, will be found, without any regular dependence or connexion, referr'd to the Titles under which they are ranged, in that order, or rather disorder, wherein they chanc'd to come to hand.

*A List of the Secondary Titles
concerning
The Spirit of Humane Blood.*

- a. **VV** Hether Humane Blood
1. may be so order'd
by Fermentation or Putrefaction,
as that in Distillation, a Spirit, ei-
ther Urinous or Vinous, may as-
cend before the Phlegm.
- b.
2. Whether Spirit of Humane Blood
be really any thing but the Vola-
tile Salt and Phlegm well com-
mix'd.
- c.
3. Of the Species of Saline Bodies
to which Spirit of Humane Blood
is to be referr'd.
- d.
4. Whether Spirit of Humane Blood
be differing from Spirit of Urine,
- H 2 and

100 *The Natural History*

and other Spirits that are call'd
volatile Alcalies.

e.

5. Of the Quantity of Spirit contain'd
in Humane Blood: Whether accom-
panied with its *Serum* or dry'd.

f.

6. Of the Specifick Gravity of Spirit
of Humane Blood.

g.

7. Of the Odour, Taste, Colour, Trans-
parency and Consistence of the Spi-
rit of Humane Blood.

b.

8. Of the Dissolutive Power of the
Spirit of Humane Blood.

i.

9. Of the Tinctures that may be
drawn with Spirit of Humane
Blood.

k.

10. Of the Coagulating Power of
the Spirit of Humane Blood.

l.

11. Of the Precipitating Power of
the Spirit of Humane Blood.

m.

m.

12. Of the Affinity between Spirit of Humane Blood, and some Chymical Oyls and Vinous Spirits.

n.

13. Of the Relation between Spirit of Humane Blood and the Air.

o.

14. Of the Hostility of Spirit of Humane Blood with Acids, whether they be in the form of Liquors, or of Fumes.

p.

15. Of the Medicinal vertues of Spirit of Humane Blood outwardly applied.

q.

16. Of the Medicinal vertues of Spirit of Humane Blood inwardly us'd in Pleurifies, Headachs, Coughs, Fevers, Scurvies, Cachexies, Dropsies, Fits of the Mother, &c.

App. An Appendix containing *Paralipomena*, and Promiscuous Experiments, and Observations concerning

H 3



cerning the Spirit of Humane
Blood.

The I. (Secondary) Title.

Whether Humane Blood may be so order'd by Fermentation, or Putrefaction, as that in Distillation a Spirit either Urinous or Vinous, may ascend before the Pblegm.

IT is not unlike, that you will think the Question propos'd in this Title, more *curious* than *necessary*; and I shall not quarrel with you if you do so. But that you may not think it groundless, I desire two things may be consider'd; first, how ordinary it is, especially since the Learned Dr. *Willis's* Writings came to be applauded, to look upon Fevers as inordinate Fermentations of the Blood. And the second, that *the* Humane Urine, which has a great cognation with the Humane Blood, will not, whilst fresh, afford by Distillation

Stillation a Spirit or Volatile Salt, till the Phlegm be first drawn off, and then requires a good Fire to make it rise; yet, if it be kept for a competent time (which usually amounts to divers weeks) in *Fermentation*, (as Chymists commonly call that, which in this case I would rather stile '*Putrefaction*') the Spirit and Volatile Salt will with a gentle Fire ascend, before much, if not before any Phlegm.

These two Considerations, as I was intimating, may keep that from being thought a groundless Question, which has been above propos'd. And, tho' I more incline to the *Negative* than to the *Affirmative*, at least as to the first part or member of the Question, yet I thought it well deserv'd to be determin'd, if it may be, by Experiment. But for want of a sufficient quantity of Blood, and good luck in making Tryals with that I could procure, I must suspend my Judgment, till further Experience resolve me one way or other.

H 4

By

By what I have yet try'd, I am not much encourag'd to expect from Humane Blood a Vinous or Ardent Spirit, tho' that be the usual product of Fermentation in Liquors, and I am the less encourag'd to expect this, because I am not sure that there is any Fermentation truly & properly so call'd in Humane Blood, either within or out of the Body; having never yet found any thing in the Blood, or Urine, that convinc'd me, that either of those Liquors would afford an ardent Spirit. I remember I once kept Humane Blood for a year together, in a Glass very carefully, and if I mistake not, Hermetically clos'd, with a purpose to try, whether any Spirits would first ascend. But when the Blood came to be expos'd to the contact of the Air, the stink was so great and offensive, especially to some Ladies that liv'd in the house, that we were fain to have it hastily thrown away. Another time, having caus'd some Sheeps
Blood

Blood to be digested in a pretty large Vial Hermetically sealed, after it had continued a good while in the Digestive Furnace, upon a sudden, tho' no Body touched it, it broke with a surprizing noise, and blew off the long neck of the Vial. Two or three almost like mischances I had with Attempts made on Humane Blood, which I was the more troubled at, because I thought it not very improbable, that by Putrefaction the Texture of Blood, like that of Urine, may be so loosen'd or otherwise alter'd, that a Volatile Salt or Spirit may in a slow distillation ascend before the Phlegm. But, as I said before, 'tis only from further Experience that I must expect Satisfaction in these Enquiries.

Yet in the mean time I shall add on this occasion, That the ill success I had in my Attempts to draw a Spirit from entire Portions of Blood, without separating any part from it, or adding any foreign Body to it,
did

106 *The Natural History*

did not hinder, but *rather* invite, me to try, whether I could not make some Experiment of affinity to those above mentioned upon whose success I might ground some kind of Conjecture, what would have been the Events of those Tryals, in case they had not miscarried. Wherefore looking upon the *Serum* of Blood as the likeliest part of it, as well as much more likely than the entire Blood, to concur to a Fermentation properly so call'd; we took some Ounces of this *Serum*, and put to it about a fourth part of Raisins (of the Sun) well bruis'd, and kept them in a Glass, whereof a considerable part was left empty, and having clos'd the Vessel, we kept it in a warm room for many days. The Event of this Tryal was, that within few days the Raisins began to emerge, and afterwards continued to float; and there was produc'd or extricated a considerable quantity of permanent and Springy Air, as by a certain Contrivance

trivance described in another Paper, did manifestly appear. Both which *Phænomena* seem'd plainly to argue, that there had been some degree of Fermentation produc'd in the mixture. But yet when we came to distill the thus alter'd *Serum*, thō it did not stink, as if it had putrefied it would have done, yet the Liquor that first ascended, even with a gentle heat, did not tast or smell like a Vinous Spirit, thō it was differing from meer Phlegm. If I had been furnished with a greater quantity of *Serum*, perhaps the reiterated Experiment would have given more satisfaction; and in making it I would have been careful to observe, whether the produc'd Fermentation might not be suspected to proceed not so much from the whole *Serum* as such, as from the Aqueous Particles, in distinction from the others that concurr'd with them to compose it.

As for the Second Question intimated in this present First Title, namely

ly, whether Blood will by Digestion or Putrefaction be so opened, as that when it is distill'd, the Spirit will ascend before the Phlegm : I likewise endeavour'd to try, That, with the Serous part of the Blood pour'd off from the Fibrous or Coagulated, as supposing it in this separated state, more proper for our Tryal than the entire Blood : and having kept a pretty quantity of this *Serum* above four times as long, as I had observ'd to have been sufficient, to make Urine in Distillation part with its Spirit before its Phlegm; we distill'd this long kept Liquor with a very gentle fire, that few or none besides the fugitive parts might at first ascend. But we found the Liquor that came over, to have but little strength, either as to smell or Taste, nor would it readily turn Syrup of violets *Green*. I say *readily*, because after they had been some hours together it would. But yet as a Volatile Alcaly, it would presently turn a strong solution made of common Sublimate

limate in fair Water, into a White, Opacous, and almost Milky Liquor.

The II. (Secondary) Title,

Whether Spirit of Humane Blood be really any thing but the Volatile Salt and Phlegm well commix'd?

Since the Question mov'd in this Title may be also propounded concerning other Alca'isate Spirits, as those of Urine, Harts-horn, Soot, &c. It is upon that account the more important. And for this Reason, as well as for the difficulty of determining it by cogent Proofs, I may think myself oblig'd to forbear taking upon me to decide it peremptorily, till further Experience shall have furnish'd me with fuller Information. So that for the present about this difficult Question, I shall venture to say no more than this, that what has hitherto occur'd

occurr'd to me, inclines me to think that the Spirit of Humane Blood is totally compos'd of Volatile Salt and Phlegm, if by Phlegm, we understand not Simple, or Elementary Water, but a Liquor, that, altho it pass among Chymists for Phlegm, and deserves that name better than any other Liquor afforded by Humane Blood, yet in the strictest acception it is not That; for when the Spirit, Volatile Salt, and Oil, are separated from it by Distillation and Sublimation, as far as they are wont to be in Chymical Preparations of Volatile Alcalies, the remaining Liquor, which passes for Phlegm, will yet be impregnated with some Particles of Oyl, and perhaps also with some few of volatile Salt, that are too minute to be distinguishable by the naked Eye. But whether frequent Rectifications may so accurately separate these Heterogeneous parts, as perfectly to free the Aqueous ones from them, and thereby

of Humane Blood. 111

thereby reduce the Phlegm to Simple or Elementary Water, I am content at least till I shall have had sufficient Quantities of distil'd Blood for making the requisite Tryals, to leave as a Problem. And this the rather, because I am not sure, but that by frequent Distillations, some Particles of the Fire may from time to time Substantially be associated with those of the Liquor ; nor yet but that even in the first Distillation of Humane Blood, The Fire may have either separated or produc'd a Liquor that though almost strengthless, and not justly referable to either of the receiv'd Principles or Ingredients, Oyl, Salt and Earth, is not yet Phlegm truly so call'd, but a Liquor as yet *Anonymous* ; as I have elsewhere shewn, that Woods and many other Bodies afford by Distillation a Liquor that is not an Oyl, and is neither Acid nor Alcalisate, and yet is no true Phlegm, but as I have there styled it, an *Adiaphorous Spirit*.

It

It will probably be thought Material, if on this occasion I add, in favour of the Opinion or Conjecture to which I lately own'd my self inclin'd, That considering that the knowledge of the Composition of a Body may be sometimes as well, if not better, investigated by the way of *generating* or *producing* of it, as by that of *Analyfing* or *Refolving* it; I made for Tryals fake the following Experiment. We diffolv'd in diffilled Water as much Volatile Salt of Humane Blood as the Liquor would take up, and then having carefully diffill'd it in a conveniently fhap'd Veffel, with a regulated degree of Heat, the Diffillation afforded us fuch a Liquor as was defir'd, namely one that by Smell, Taft and divers Operations, appear'd to be a good brisk Spirit of Humane Blood. This Experiment for the main, was made another time with the like fuccefs.

The

The III (Secondary) Title.

*Of the Species of Saline Bodies to which
the Spirit of Humane Blood is to be
refer'd.*

I need not spend much time to declare a thing that is now so well known to many Physicians and Chymists of this and some of the neighbouring Countries, as 'tis that of late years Saline Spirits obtain'd by Distillation have been observ'd to be of two sorts. But because there are many, even of the Learned especially in the remoter parts of Europe, that are not well acquainted with this Distinction, lest some to whom you may shew this Paper should chance to be of that number, it may not be amiss to intimate in two or three Words, that the *Saline Spirits* that ascend

cent in Distillation, are some of them *Acid* in *Tast*, as Spirit of Nitre, Spirit of Vitriol, &c. And some others have Tasts very differing from that, being rather somewhat like *Common Salt*, or like *Lixivate* Salts. And the difference is greater in their *operations* than in their *Tasts* ; For being put together there will presently ensue a manifest Conflict between them, and usually (for I have not found it to hold in all cases) the one will Precipitate the Bodies that the other hath Dissolved. And 'tis necessary to add, that among the Salts called *Alcalies*, some are *Fixt* in considerable degrees of Fire, and others not, for which reason divers modern Spagyrist and Physicians, that take *Acid* and *Alcaly* for the true *Principles* of Mixt Bodies, call the one *Fixt* and the other *Volatile Alcalies*. And, though I have elsewhere questioned this Doctrine, and given my Reasons why I approve neither it nor the Appellations newly mention'd, and often call the Salts
made

made by *Combustion*, simply *Alcalies* or else *Lixivate Salts*, and those that *ascend* sometimes *Urinous*, and sometimes *Volatile Salts* and *Spirits*: yet, since the Names of *Fixt Alcalies* and *Volatile* ones are now much in request, I shall comply with custom, & oftentimes (though not always) make use of them in the sense of those that employ them.

These things being premis'd I may now seasonably propound this important Question, *To what Species of Saline Bodies the Spirit of Humane Blood is to be referr'd?* I say of *Saline Bodies*, because though the Spirit of Blood be a Liquor, yet its more efficacious Operations seem almost (if not more then almost) to ally to depend upon the Fugitive Salt where-with it abounds. The ground of the foregoing Question may be twofold; the one, that I have elsewhere prov'd against the general supposition, that some *Volatile Salts*, that arise even in a dry form, may not be of an *Alcali-*
I 2
fate ;

sate ; but *Acid* nature, and the other, that not only *Helmont* and his Disciples, but a great part of the Modern Chymists and Physicians too, ascribe Digestion to an Acid Ferment or *Menstruum* in the Stomach ; Whence one may suspect that store of Acid Corpuscles may pass into the Mass of Blood, & impregnate it, as I else where shew that Particles of differing Natures may be even by the senses discovered to do.

But notwithstanding this, I shall not scruple to say in answer to the propounded Question, that, as far as I have hitherto been able to observe, the Spirit of Humane Blood is manifestly referable to that Classis that many call *Volatile Alcalies* (and I often call *Urinous Spirits*) for I find Spirit of Blood capable of doing those things, the performance of which has been looked on almost ever since I publickly propos'd them, as the Touchstone to know Volatile Alcalies, and distinguish them from the other sorts of Saline Bodies. For the Spirit of Hu-
mane

mane Blood will make a great conflict with divers Acid Spirits, as Spirit of Salt, *Aqua fortis*, &c. It will immediately turn Syrup of Violets from its Blew Colour into a fair Green, 'twill Precipitate a Solution of Sublimate in common Water, into a White Powder, and in short I found it to perform those other things that may be expected from *Volatile Alcalies* as such, as often as I had occasion to make Tryal of it, sometimes on one Body, and sometimes on another.

If I were sure (as for Reasons elsewhere declar'd I am not) that the Digestion of Aliments were made by an Acid Ferment or Juice, whence-soever the Stomach is furnish'd with it, I should be prone to suspect that some Acid Particles may be mingled with the Blood. But however that would not hinder me from referring the Spirit of Humane Blood to Volatile Alcalies, because so few Acid Particles would be either destroy'd

by the *Alcalifate* ones, that are so abundant in the Spirit, or at least these would be so very much predominant, as to allow us very warrantably to give on their account a Denomination to the Mixture. As if a few *drops* of Spirit of *Vinegar* were mix'd with some *Pints* or *Pounds* of stale *Urine*, they would either be depriv'd of their Acidity by some *Corpuscles* of a contrary nature, that they would meet with in the Liquor, or they would be so obscur'd and overpower'd by the Fugitive Salts it abounds with, that the Acetous *Corpuscles* would not hinder the Spirituous Liquor drawn from the Mixture by distillation, to be justly referable to the *Classis* of *Volatile, Urinous Salts*.

The

The IV. (Secondary) Title.

Whether Spirit of Humane Blood be differing from Spirit of Urine, and other Spirits that are call'd Volatile Alcalies ?

THe Question, *Whether there be any difference between the Spirit of Humane Blood, and other volatile Alcalies ?* As Spirit of Urine, Harts-horn, &c. seems to me very difficult to be decided, because two Bodies may agree in many Qualities, and perhaps in all of those that are the most obvious, and yet may on some third Body, or in some Cases, manifest distinct Powers, and have their peculiar Operations. Nor do I yet see any certain way, by which the Affirmative part of the Question, tho' it should be true, can be clearly demonstrated. Therefore

I 4 leaving

leaving the peremptory Decision of this Question, to those that shall think themselves qualify'd to make it, I shall (at least till I be further inform'd) content my self to make a Couple of Remarks, in reference to the propos'd Enquiry.

And first I think, there may be a great difference between Volatile Salts or Spirits, as they are ordinarily prepar'd for medicinal uses, and as they may, by reiterated Rectifications, and other ways of Depuration, be brought to as great a simplicity or Purity, as a dextrous Chymist can bring them to: I thus express my self, because as to an Exquisite or Elementary Simplicity tho' some eminent Artists pretend to it, I am not sure that Chymists can attain it; especially considering what I else where shew of the unheeded Commixtures, that may (at least sometimes) be made by the Corpuscles of the Fire, with those of the Bodies it works on.

My

My other Remark is, that whether or no, if the Spirit of Humane Blood, and other Liquors abounding like it in Volatile Alcalies, were reduc'd to as great a purity as they can by Art be brought to, they would be altogether alike in their Nature and Qualities; yet, if we consider them (as men use to do) in that state wherein they are wont to be thought pure enough for medicinal uses, and are accordingly employ'd by Physicians and Chymists; I think it very probable, that there is some difference between the Spirit of Humane Blood and some other Volatile Alcalies. and particularly those afforded by Urine and by Harts horn. For tho' to me the bad smells of all these Liquors seem to be much alike, yet divers Ladies, and those of very differing Ages, affirm they find a manifest difference between these smells, and do abhor the odour of Spirit of Blood as a stink, though they will with pleasure hold their noses a great while

while over the Sp. of Harts-horn, and even that of (vulgar or European) Sal-armoniac (which is in effect a Sp. of Mans Urine) and affirm themselves to be much refresh'd by it. And, whereas with Spirit of Urine or of Sal-armoniac joyn'd in a due proportion with Spirit of Salt, I have usually (as I have

long since noted in another Paper *a*) been able to make a Salt

a The usefulness of Experimental Philosophy.

that shoots into the peculiar Figure of *Sal-Armoniac*, which figure is very differing from that of Sea-Salt, Nitre, &c. I have seldom, if ever obtain'd (at least in any quantity) a Salt of that shape, by the commixture of the Spirit of Humane Blood, with that of common Salt; for, though their Saline Corpuscles, upon the Evaporation of the Superfluous moisture, would coagulate together, yet the concretion seem'd confus'd, and either all or a great part of it was destitute of that neat and distinct shape, that I had several times observ'd

observ'd in concretions, made by the mixture of the Spirit of Sea-Salt with Urinous Spirits. And, as to the Medicinal vertues of Spirit of Blood, *though* I have not had opportunity to make comparifons experimentally, and therefore shall forbear to affirm any thing my self, yet, if we credit the famous *Helmont*, there is a considerable difference between the Sp. of Humane Blood, & that of Humane Urine, since he ſomewhere expreſſly notes, (*though* I remember not the place, nor have his Book at hand) that the Spirit of Humane Blood cures Epilepsies, which is a thing the Spirit of Urine will not do.

The V. (Secondary) Title.

*Of the Quantity of Spirit contain'd in
Humane Blood whether accompany'd
with its Serum or dry'd.*

TIs not easy to determine the exact proportion of that Liquor, which, when by Distillation obtain'd from Humane Blood, the Chymists call its *Spirit*, in reference to the other Principles or Ingredients whereof the Blood consists. For some Mens Blood may be much more Phlegmatick or serous than that of others, which it self may be more or less Spirituous according to the Complexion, Age, Sex, &c. of the person that bleeds. But, to make some Estimate, that will not probably much recede from what may be ordinarily found, I shall inform you, that Twelve Ounces of
healthy

healthy Humane Blood afforded us seven Ounces and a half of Phlegm, and consequently about Four Ounces and a half of dry stuff. And then I shall add, that having committed to Distillation in a Retort in a Sand Furnace seven Ounces of well dry'd (but not scorch'd) Blood, we obtain'd about seven Drams, that is, about an Eighth part of Spirit, to which tho' it were not rectified, that Name may well enough be given, because it was so very rich in Spirituous and Saline parts, that it left in the Receiver, and in the Vial I kept it in, a good deal of Volatile Salt undissolv'd, which a Phlegmatick Liquor would not have done. And if that be admitted for a truth, that was above propos'd as a very likely Conjecture; namely, that Spirit of Blood is but Salt and Phlegm united, we may well suppose that Humane Blood yields a far greater proportion of Spirit than this; since from the seven Ounces of dry'd Blood last mentioned,

mentioned, we obtain'd about Five Drams of Volatile Salt, which if we had by Distillations united with a fit quantity of Phlegm, would probably have afforded us near Two Ounces more of a Liquor deserving the name of Spirit.

The VI. (Secondary) Title.

Of the Consistence and Specifick Gravity of the Spirit of Humane Blood.

TO the Consistence of the *Spirit of Humane Blood*, taken in the more laxe sense of the word *Consistence*, one may refer its *Specifick Gravity*, (as that is usually proportionate to the *Density* of Bodies,) the greater or lesser degree of *Fluidity* that belongs to the Liquor as a Mass, and the greater or lesser *Subtilty* of the Minute Parts whereof it is compos'd,

pos'd, or wherein it abounds.

And as to the first of the Three *Attributes*, we have noted to be referrable to the *Consistence* of our *Spirit*; *Gravity* is a Quality that is so radicated, if I may so speak, in the nature of *Visible Fluids* or *Liquors*, and does so obstinately accompany them, that I durst not omit to examine the *Specifick Gravity* (that is, the *Gravity in proportion to the Bulk*) of *Spirit of Humane Blood*; though by reason of the small quantity I had of it, I could not make use of the same Instruments, that I was wont to employ in Hydrostatical Tryals, where I was not so stinted in the Liquor to be examined. But however I made a shift to make a Tryal of this kind, by which I found, that a compact body weighing fifty eight Grains in the *Air*, and in *Water* six Grains and three fourth parts weighed in Rectified *Spirit of Humane Blood*, but five Grains and one fourth part. And on this occasion I shall tell you, what

what I presume, you did not expect, which is, that notwithstanding the Volatility of our Spirit of Blood, I found that a pretty large piece of Amber being put into it, did not, as most men would confidently expect, fall to the bottom of the Liquor, but kept itself floating at the upper part of it, and if plung'd into it would emerge.

The next Quality we refer'd to the *Consistence* of our *Spirit of Blood*, is the *Degree* of its *Fluidity*, or, if you please, its greater or lesser *Immunity from Tenaciousness or Viscosity*, which some *Modern Philosophers* (whose Opinion needs not here be discuss'd) think to belong to all *Liquors* as such. Now one may be the more inclin'd to expect a manifest Degree of *Tenacity* in the *Spirit of Humane Blood*, because among many *Modern Chymists* it passes for an *Alcaly*; and we know that divers other *Alcalisate Liquors*, as *Oyl of Tartar per deliquium*, *Fix'd Nitre* resolv'd

solv'd the same way, *Solution of Potashes*, &c. are sensibly *unctuous*, and but languidly Fluid. But yet I did not observe, that some rectified Spirit of Humane Blood, that I purposely try'd between my Fingers, did feel more *unctuous* than *Common Water*. And whereas those that sell *Brandy*, or *Spirit of Wine*, are wont to shake it, till it afford some *Froth*, and then by the stay this makes on the Surface, to judge of the *Tenacity* or *Tenuity* of the Liquor, esteeming that to be the most *Unctuous*, whereon the *Bubbles* make the *longest stay*, and that the finest on which they soonest disappear; I thought fit by the same Method to examine Spirit of Humane Blood, and found that the Froth would last very little on the Surface of it, the bubbles breaking or vanishing, almost (if not quite) as nimbly, as if the Liquor had been good Spirit of Wine. And I likewise observ'd, that when I warily let fall some of our well rectify'd Spirit of

Blood upon some other body, it seemed to me, that the single drops were manifestly smaller than those of Water, and of several other Liquors, would have been, which will be much confirm'd by one passage of what I have to say about the third Quality referrable to the Consistence of the Spirit we treat of.

Because it may be a thing of some Importance, as well as Curiosity, to know how *subtil* the *active parts* of *Spirit of Humane Blood* are, and how disposed and fitted to disperse or diffuse themselves through other Liquors of convenient Textures; to make a visible discovery of this, I bethought my self of a Method, that having formerly devised for several purposes, I thought fitly applicable to my present Design. For having looked upon it as a great defect, that men have lazily contented themselves to say in general, that such a Body is of *subtile*, or of *very subtile* Parts, without troubling themselves to find out any way
of

of making more *particular* and less indeterminate *Estimates* of that *subtily*; I was invited to find out and practise a way that might on divers occasions somewhat supply that defect. But having delivered this easy method in another Paper, I shall forbear to repeat a tedious account of it in this; since it may here suffice to tell you in short, what will perhaps surprize you; namely, That according to the forementioned way, we so prepar'd Common Water by Infusions made in it without heat, that by putting one single drop of our rectified Spirit of Humane Blood into $\text{ʒiv.} + \text{ʒiv.}$ (which make 2000 grains) of the prepar'd Water, and lightly shaking the Vial, there appeared throughout the Liquor a manifest Colour, whereof no degree at all was discernible in it just before. Which sufficiently argues a wonderful subtilty of Parts in the Spirit we employ'd; since that a single drop of it could disperse its Corpuscles, so as to diffuse it self

K 2 through,

through, and mingle with two thousand times as much Water, and yet retain so much Activity, as to make their presence not only sensible, but conspicuous, by a manifest change of Colour they produc'd. I confess this computation is made, upon supposition that a drop of Water weighs about a grain, and that a drop of our Spirit of Blood was of the same weight with a drop of Water.

The former supposition is commonly made; and though I have not found it to be exactly true, but that a drop of Water weigh'd a *Tantillum* more than a Grain; yet that difference is much more than recompens'd, by that which we found between the weight of a drop of Water, and the weight of one of Spirit of Humane Blood. For having in a very good and carefully adjusted Ballance, let fall ten drops of Common Water, and as many of our Rectified Spirit of Humane Blood, (as judging it a safer way to make
an

an Estimate, by comparing so many drops of each Liquor than one alone ;) we found, as we might well expect, that a drop of this last nam'd Liquor, as it was manifestly lesser, so it was far lighter, than a drop of Water, in so much, that the whole ten drops did not amount to four Grains. So that we may safely judge the drop of Spirit to have manifestly diffused it self, and acted upon above 4000 times so much Water in weight, (and perhaps in bulk too) since indeed the proportion extended a good way towards that of one to 5000 ; and so may be said to be as that of one to between 4000 and 5000, which, *tho* it may seem incredible to those that are unacquainted with the great subtilty of Nature and Art, in the Comminutions they can make of Bodies ; yet I can by repeating the Experiment easily convince a doubter, in less than a quarter of an hour. And this Subtilty of the Parts of Blood,

K 3 will

134 *The Natural History*

will appear yet greater, if it be consider'd, (what I think I can evince,) that no contemptible part of the single drop I employ'd was Phlegm, useless to the change produc'd, the operation being due to the Energy of the Saline Spirits of the little drop.

The VII. (Secondary) Title.

*Of the Odour, Taste, Colour, and
Transparence of the Spirit of Hu-
mane Blood.*

THose *Qualities*, that in my Opinion more generally than deservedly are call'd *first*, do not any of them belong to the Spirit of Humane Blood, in such manner as to oblige me to say any thing of them in relation to it. And therefore I shall content my self to have made this transient mention of them, to keep it
from

from being thought, that through forgetfulness I had overlook'd them. Yet something there is, that may not inconveniently be refer'd to the heat or coldness of Spirit of Humane Blood; in regard that Physicians, as well as Philosophers, distinguish these Qualities into *Actual* and *Potential*. For it seems, that the Spirit of Humane Blood is in reference to some Liquors potentially cold, since it refrigerates them, and in reference to some others potentially hot, since being mingled with them, the mixture becomes actually hot. Of this last I shall here set down the ensuing Instance.

Into a slender Cylindrical Glass we put the lower part of an Hermetically Seal'd Thermoscope, which in this Paper and elsewhere I usually call the gag'd one, because it was adjusted according to the standard of such Instruments kept at *Gresham* Colledge. Into this Cylindrical Glass we pour'd as much moderately

K 4.

strong

strong Spirit of Blood, as would cover the Ball of the Thermometer, and then drop'd on that Liquor some good Spirit of Salt, upon whose mingling with it there was produc'd a Conflict accompany'd with noise and bubbles, and a heat, which nimbly enough made the Spirit of Wine ascend above two inches and a half. This Experiment is therefore the more considerable, because there are divers Volatile Alkalies that being confounded with Acid Spirits, tho they seem to make a true Effervescence, yet do really produce a notable degree of Coldness. And that which to me seem'd considerable on this occasion, was, that whereas I had several times found by Tryal, that the Spirit of Verdegrease (which some call the Spirit of *Venus*) would with the Volatile Salt of Sal Armoniack, or of Urine, produce a seeming Effervescence, but a real coldness; this Spirit of Verdegrease it self, being mix'd in the forementioned small Cylindrical

drical Glafs, with but moderately strong Spirit of Blood, did not only produce a hissing noise and store of bubbles, but an actual heat, whereby the Spirit of Wine in the Thermoscope was made quickly to ascend above an inch and a half, tho the Liquors employ'd amounted not both together to two spoonfuls.

The VIII. (Secondary) Title.

*Of the Dissolutive Power of Spirit
of Humane Blood.*

IT will not only serve to manifest the Subtilty and Penetrancy of the Spirit of Human Blood, but it may be also of some use to Physicians, if it be made appear by Experiments, that this Spirit is by itself not only a good *Medicine* for several diseases, (as will be hereafter shewn,) but may be also employ'd
as

as a *Menstruum*, to dissolve several Bodies, and even some Metalline ones. And because these last mention'd are the most unlikely to be readily dissoluble, by a substance belonging to the *Animal Kingdom*, as Chymists speak; I shall subjoyn two Tryals, that I made to evince this Dissolutive Power of the Spirit of Blood.

And first we took Crude Copper in Filings, (which if they be very small, are so much the fitter for our purpose) and having pour'd on them some highly rectify'd Spirit of Human Blood, we shook them together, and in about a quarter of an hour or less, perceiv'd the *Menstruum* to begin to look a little Blewish, which argu'd its operation to have already begun. And this colour grew higher and higher, till after some hours the *Menstruum* had dissolved Copper enough to make it deeply Ceruleous. Some other, and somewhat differing Tryals on the same Metal will be met with in their
proper

proper place. In the mean time I shall here take notice, that in some Circumstances the Spirit of Blood has such an operation upon Copper, whose quickness is surprising. For having made a coin'd piece of that Metal clean and bright (that no grease or foulness might hinder the effect of the Liquor,) and put a drop or two of our Spirit upon it, within about half a Minute of an Hour, (observ'd by a watch that shew'd Seconds) the verge of the moistned part of the Surface appear'd blewish, and almost presently after, the rest of the wetted part acquir'd a fine Azure Colour.

We also took filings of *Zink*, or (as in the shops they call it) *Spelter*, and having pour'd on them very well rectified Spirit of Blood, we observ'd, that even in the cold it quickly began to work manifestly, tho' not vigorously. But being assisted with a little heat, it dissolv'd the *Zink* briskly, and not without producing
store

store of bubbles, being also a little discolour'd by the operation of this Experiment, some use is made in another place, and therefore need not be deliver'd in this.

On this occasion I shall add, that for curiosities sake I took a piece of Coagulated Blood, but not dry'd, somewhat bigger than a large Pea, having a care to take it from the lower part of the lump of Blood, that it might be black, the superficial part of Fibrous Blood that lies next the Air, being usually Red. This clot of Blood we put into a slender Vial of clear Glass, that the colour might be the better discern'd, and then pour'd on it a little Rectified Spirit of Humane Blood, and shook the Glass alittle; whereupon in a trice the colour of (at least) the Superficial part of the Blood, was, as I had conjectur'd, manifestly chang'd, the blackness quite disappearing, and being succeeded by a very

very florid colour like that of fine Scarlet. The Liquor also was ting'd, but not with near so deep or so fair a Red, and by the little bubbles that from time to time past out of the Clod into it, it seem'd to work somewhat like a *Menstruum*. And yet soon after coming to look upon this lump of Blood again, I found it to have much degenerated from its former colour, to one less fair and more dark.

We took also another Clot of Blood like the former, save that one part of it which had lain next the Air, was not black; and having in a Vial like the former pour'd on it some Spirit of Blood, taken out of the same Vial whence I took the first parcel, the Reddish colour seem'd present'y to be much improv'd, and made more fair, and like true Scarlet. But the black was not so alter'd, as to be depriv'd of its blackness, but retain'd a dark and dirty colour. So that this second Experiment

riment requires a further Tryal, when there shall be conveniency to make it, and it will the rather deserve one, because what has been already recited of the Operation of the Spirit upon the two parcels of Blood, may suggest uncommon Reflections to Speculative Wits.

And here on this occasion it will be proper to relate to you, that having a confus'd remembrance, that I had a great while before put up some Humane Blood, with a certain quantity of Volatile Spirit, to keep it fluid and preserve it, without distinctly remembering what Volatile Alcaly I had employ'd; I found among other Glasses that had been laid aside, one Bolt-head with a long Neck, to which was ty'd a Label, importing that at such a time twelve Drams of Humane Blood, were put up with two Drams of Spirit of Humane Blood. By the date of this Paper it appear'd, that this Blood had been preserv'd much above a whole

whole twelve Month; and yet it appear'd through the Glafs of a fine Florid Colour, and seem'd to be little less than totally Fluid. And indeed when we came to open the Vessel, which was carefully stop't with a good Cork, and hard Sealing Wax, we found no ill scent or other sign of Putrefaction in the Mixture, and but a very small Portion of Blood lightly clotted at the bottom; the rest passing readily through a Rag. So that the Spirit of Humane Blood seems to have a great embalming Vertue; since 'twas able so long and well to preserve six times its weight, of a Body so apt to Concrete and Putresce, as Humane Blood is known to be, and probably would have preserv'd it much longer, if we had thought fit to prosecute the Experiment. To this account of our Trial I know not whether it will be worth while to add, that having broken it off, that we might distill the above mentioned Mixture with a
very

144 *The Natural History*

very gentle heat, the first Liquor that ascended was not a Spirit, but a kind of Phlegm, thô afterwards there came up, besides a Spirituous Liquor, a Volatile Salt in a dry form.

On this occasion I shall subjoyn the following Tryal, long since made with a Spirit, that I supposed to have been weaker than that, with which the lately mentioned Experiments were made.

In order to a design that need not here be mentioned, I caus'd some Filings of *Mars* to be purposely made, that being presently employ'd they might not contract any Rust, whereby the operation of our Liquor might be made doubtful. On these we poured some of our Spirit, and having kept them together a while in Digestion, we found as we expected, that the Liquor had wrought on the Metal, and produc'd a considerable quantity of a light substance, in colour almost like *Crocus*,
but

but something paler. And we also found more than we expected; for there appeared in the Liquor good store of thin Plates, like a kind of *Terra Foliata*, (as the Chymists speak) which after a very slight agitation, being held against the Sunbeams, exhibited the Colours of the Rain-bow in so vivid a manner, as did not a little delight, as well as surprize the Spectators, but I did not perceive that the tast of the Liquor was considerably Mar-

L

The

The IX. (Secondary) Title.

*Of the Tinctures that may be drawn
with Spirit of Humane Blood.*

MOST of those Extractions the Chymists call *Tinctures*, being, as I have elsewhere shewn, partial *Solutions* of the Bodies from which they are obtain'd, 'twill I presume be easily granted, that since the Spirit of Blood is able (as in the foregoing Title it has appear'd to be) to dissolve Copper and Zink, that are Solid and Metalline Bodies, 'twill be able to extract *Tinctures* out of divers others. But, that this power of our *Menstruum* may be rather prov'd than supposed, it will not be amiss to add a few Instances of it.

Spirit of Blood being put upon English Saffron, did soon acquire upon it a fine Yellow Colour.

Spirit

Spirit of Blood being put upon Powder'd *Curcuma*, or, as Tradesmen are wont to call it, *Turmerick*, did in the cold Extract from it a lovely Tincture, like a rich solution of Gold; which probably (to intimate that upon the by) may prove a good de-obstruent Medicine, particularly in the Jaundise; in which disease *Turmerick* that is taken to be a kind of *East Indian Saffron*, is upon experience commended, and in this our Tincture is united with Spirit of Humane Blood, which is very near of kin to Spirit of Urine, and probably at least as efficacious; with which Liquor, when well rectify'd, I have had more than ordinary success in the Jaundise.

To make some Trial of the Extracting Power of the Spirit of Blood, upon substances that have belong'd to Animals, I thought it might particularly conduce to some Medical purposes, to try what it would do upon the solid part of Hu-

mane Blood it self slowly dry'd, so as not to be burn'd, but only to be reducible with some pains to fine Powder. Accordingly upon this well sifted Powder of Blood, we put some moderately strong Spirit of the same subject, on which the Liquor began very soon to colour it self, even in the cold; and within no long time after, it appear'd as Red as ordinary French Claret Wine. This Extraction made me suspect, that the Phlegm that was not carefully separated from the Spirit I then employ'd, might hasten the coloration of the *Menstruum*. For which reason I put upon another Portion of the same Powder some rectify'd Spirit of Blood, so well deslegmed that it would not dissolve a grain of the Volatile Salt of Blood: And I found indeed, as I suspected, that this *Menstruum* did not any thing near so soon draw a Tincture, as the other had done; for after divers hours the colour it had obtain'd was but brown,
but

but after some hours longer the colour appear'd to be heightned into Redness, but yet manifestly inferiour to that of the somewhat Phlegmatick Spirit above mentioned, where-to it did yet in a longer time grow almost equal. By this means we may not only disguise the Spirit of Blood, but impregnate it with the finer parts of the unanalys'd solid Body, which may possibly make the Spirit a Remedy more proper for some Diseases or Constitutions: and this Medicine I sometimes call the entire Tincture of Humane Blood, because it consists of nothing else but such Blood.

To shew at length that the Spirit of Humane Blood may extract Tinctures out of some of the hardest Bodies, I made the following Experiment.

We took some choice Filings of Steel (for such are those that are saved by the Needlemakers) and having put them into a small Egg, we

L 3

pour'd

pour'd on them some highly rectify'd Spirit of Blood, and kept them all Night in digestion in a moderate heat. The next day (but not early) we found the *Menstruum* turn'd of a Brownish Red colour, that was deep enough. And some of the Filings that chanc'd to stick to the sides of the Glass, but were higher than the Liquor could reach in its gross body, seem'd to have been, either by Exhalations from the *Menstruum*, or perhaps by the Transient Contact of it, as it was pouring in, turn'd into a kind of Yellow (*rocus Martis*). I must not here forget, that having kept the *Menstruum* and the Filings together in the forementioned Egg for some days longer, the colour was grown opacous, and appear'd to be black, when it was look'd on in any considerable bulk, this last expression I employ, because it had another appearance, when it was somewhat thinly spread upon White Paper.

Perhaps

Perhaps it may be a Remark not altogether useless to Physicians, among many of whom Chalybeate Remedies are in very great request, if I add, that for reasons not needful to be mentioned here, having a suspicion that our Spirit would work upon Steel, in another manner than the Acid Solvents wont to be used by Chymists and Physicians, we pour'd some of our Tincture drawn from Filings of Steel, upon a freshly drawn Tincture of Galls (infus'd in Common Water,) and did not find that this Liquor would with the Infusion make any Inky mixture, nor that the Precipitate that was quickly produc'd, was of a black, much less of a true Inky colour : Though I have found means to produce in a trice a black mixture, with other Martial Solutions and Tinctures, which for curiosities sake I sometimes made Green, sometimes Red, sometimes Yellow, and sometimes, if I mistake not, of neither of those colours.

I have been the more express in setting down the Particulars above delivered, because I hope they may be somewhat helpful to Rectify the Judgment of divers very ingenious modern Physicians, especially among the Cultivators of Chymistry, who build much upon a supposition, which though I deny not to be specious, I doubt is not solid, and I fear may be of ill consequence. For by the above recited Tryals it may appear, that 'tis unsafe either to suppose, that if Chalybeates be dissolv'd in the body, it must be by some Acid Juice; or to conclude, that if Steel be dissolv'd by the Liquors of the Body, it must be *ex prædominio*, (as they speak) Alcalisate; since a Liquor that exercises a great Hostility against Acids, dissolves it; and by parity of reason one may probably infer the quite contrary of what they suppose; in regard that Steel in our Experiment was (partially at least) dissolv'd by what they call

call an *Alcaly*; and consequently ought to be *ex prædominio*. of an Acid nature. But of this *Hypothesis* we elsewhere purposely discourse, and therefore shall here add nothing concerning it, but leave it to be consider'd, whether it would not be requisite to seek out some other way, than Physicians have hitherto pitch'd on, to explicate the manner of operation of Chalybeate Medicines in the Humane Body; and whether some use may not be made in Medicine, of Martial Remedies prepar'd by Volatile Alcalies, instead of Acids.

I put some Spirit of Humane Blood upon powder'd Amber, sifted through a fine Sieve, and kept it in Digestion for some days, giving it a pretty degree of heat; but we obtain'd not hereby any Tincture at all considerable; whether it was, that the Spirit was not yet highly enough rectify'd, or that the Amber (which was of a finer sort of white Amber)

was

154 *The Natural History*

was not so proper to yield its Tincture, as I have several times found courser, but deeper colour'd Amber to be.

To this (IX.) Title may be refer'd the event that followed, upon our having put some Spirit of Humane Blood upon that sort of *Gum-Laccæ*, that comes out of the *East Indies* in Grains, and (for that reason) is commonly call'd *Seed-Lac*. For the Spirit we put upon this, tho this be a resinous Gum, and of no easy Solution, soon became tinged; which I expected it should, because I conjectur'd that the Redness wont to appear in many of the Seed-like Grains, is but superficial, and proceeds from some adhering Blood of the little (winged) Insects, that by their bitings occasion the production of this Gum, upon the Twigs of the Tree where the *Lac* is found; on which Twigs I have more than once seen store of these Gummous Grains. So that the Tincture seems not to be

be drawn from the *Lac* it self, but rather to be afforded by the Blood of these little Animals, which the Spirit of Humane Blood, that will draw Tinctures from dry'd Mans Blood, dissolves; and this Tincture may probably be a good Medicine, since most of the Insects us'd in Physick, as *Millepedes*, Lice, Bees, Aunts, &c. Even in our colder Climates, afford Medicines of very subtle and piercing parts, and of considerable efficacy.

The

The X. (Secondary) Title.

Of the coagulating Power of the Spirit of Humane Blood.

THough the Spirit of Humane Blood, have such a dissolving power as we have mention'd, in reference to some Bodies, yet upon some others it seems to have a quite contrary Operation. I say *seems*, because it may be question'd, (and I am not now minded to dispute it) whether the effect I am going to speak of be a *Coagulation*, properly so call'd, that one Body makes of another or a Coalition of Particles fitted, when they chance to meet one another, (in a convenient manner,) to stick together. But whatever name ought to be properly given to the thing I am about to speak of, I have found by Tryal purposely made, that
the

the highly rectified Spirit of Humane blood, being well mingled by shaking with a convenient quantity, (which should be at least equal) of Vinous Spirits that will burn all away, (for if either of the Liquors be Phlegmatick, the Experiment succeeds either not at all, or not so well) there will presently ensue a Coagulation or concretion, either of the whole Mixture, or a great portion of it, into Corpuscles of a Saline form, that cohering loosely together, make up a Mass that has consistence enough not to be fluid, though it be very soft : and in this form it may remain as far as I have yet tryed, for a good while, perhaps several weeks, or months at least, if it be kept in a cool place.

The

The XI. (Secondary) Title.

*Of the Precipitating Power of Spirit
of Humane Blood.*

OF the Precipitating Power of Spirit of Humane Blood, I have yet observ'd nothing that is peculiar, and therefore it may suffice to say in general, that, as far as I have had occasion to try, it has in common with those other Volatile Spirits, which I elsewhere call *Urinous*, a Power of Precipitating most Bodies that are dissolv'd in Acid *Menstruums* I say *most*, because (as I have elsewhere more fully shewn) it is an Error, though a vulgar one, to suppose (as Chymists and Physicians are wont to do) that whatever is *dissolv'd* by an *Acid* will be *Precipitated* by an *Alkali* as such, whether Fixt or Volatile, which latter sort they take
the

the Spirits of Urine, Blood, &c. to be of. For there is no Necessity this Rule should hold, when the Body is of such a nature, that it may be dissolv'd as well by an *Alcaly* as by an *Acid*. And though, the Hypothesis of *Alkali* and *Acidum* allowed them not to think there were any such Bodies, yet I have in another Paper Experimentally evinc'd, that there are so. And it may be prov'd without going very far, since we lately ^{a See the viii. Title.} observ'd ^a that good

Spirit of Humane Blood

Would in the cold dissolve both Copper & Zink, which are Bodies that will each of them be readily dissolv'd by *Aqua fortis*, and some other *Acid Menstruums*.

Bating such Bodies as those I have been speaking of, I have not found but that Spirit of Humane Blood Precipitates other Bodies dissolv'd in *Acid Menstruums*, much after the same

same manner that Spirit of Urine and other such Volatile Alcalies are wont to do. Of this, among other Instances, I remember that I made Tryal upon Red-lead or *Minium* dissolv'd in the Acid Salt of Vinegar, Silver in *Aqua fortis*, Gold in *Aqua Regia*, and Tin dissolv'd in an appropriated *Menstruum*. I also with our Spirit Precipitated the Solutions of divers other Bodies, which need not here be nam'd. But in regard of the great and frequent use that men make of Sea Salt, in preserving and seasoning what they eat, it may not be amiss particularly to mention that out of a solution of common Salt made in common Water, we could readily Precipitate with the Spirit of Blood, a substance that looked like a White Earth; and such a substance I obtain'd in far greater quantity, from that which the Salt-makers call *Bittern*, which usually remains in their Salt pans after they have taken out as much, or near as much

much

much Salt, as would Coagulate in figured grains.

The Spirit of Humane Blood does also make a Precipitation of *Dantsick* Vitriol dissolv'd in Water, but not, that I have observ'd, a total one, which you need not wonder at, because it will dissolve Copper, which is one of the Ingredients of Blew Vitriol.

The XII. (secondary) Title.

Of the Affinity between Spirit of Humane Blood and some Chymical Oyls and Vinous Spirits.

THough in another Paper ^a I declare my self, for Reasons there express'd, dissatisfy'd with the Vulgar Notions of *Sympathy, Antipathy, Friendship, Affinity, Hostility, &c.* that are pre-
M sum'd.

^a About the Mechanical Origine or Production of Qualities.

sum'd to be found among Inanimate Bodies, yet in this place nothing forbids to employ the Terms *Affinity* *Cognition*, and *Hostility*, in the lax and popular sense, wherein they are us'd not only by the Vulgar, but by School Philosophers and Chymists.

It seems then, according to this acception of the Word *Affinity*, that there is such a thing between Rectified *Spirit of Humane Blood*, and pure *Spirit of Wine*; since we have formerly (under the Tenth Title) observ'd, that being put together they will readily *Concoagulate*, and continue united a long time. It is very probable, that the like *Association* may be also made with other *Ardent Spirits* prepar'd by Fermentation.

We have likewise formerly noted, that our *Spirit* will make a *Solution* of the *finer parts of Humane Blood* well dry'd, which Instance I mention on this occasion, because it seems
to

to be the Effect of some *Affinity* or *Cognition* (as most men would call, what I would call *Mechanical Congruity*) between the Spirit and the Body it works on, in regard I found, by more than one Tryal purposely made, that a highly Rectified *Vinous Spirit* (for if it be *Phlegmatick*, the Water may dissolve some of the Blood) would not (at least in divers hours that my Tryals lasted) draw any Tincture from it.

With *Lixivate Liquors*, such as are made of Salt of Tartar, fix'd Nitre, &c. resolv'd in the Air or otherwise, the Chymist will expect that the *Spirit of Blood* should have an Affinity, since they esteem all these Liquors *Alcalies* though *this* be *Volatile* and *those* be *fix'd*. But though these Liquors comport well with one another, yet we find not that they strictly Associate by *Concoagulation*, as we lately observ'd the *Spirit of Blood* to do with *Spirit of Wine*.

See the Produ-
cibility of Chy-
mical Princi-
ples.

The same *Spirit of Blood* mingles readily with that *Spirit of Vegetables*, that I have elsewhere given a large account of under the Title of *Adiaphorous Spirit*, which argues that there is some Affinity between them, or rather, that there is not any manifest Hostility or contrariety.

The like Relation may be found between *Spirit of Blood* and many other Liquors, which it were needless and tedious to enumerate. It may better deserve the consideration of a Chymist, that though there is manifestly a near *Cognition* between the *Spirit of Humane Blood* and the *Oyl*, since they both proceed immediately from the same Body, yet even dephlegm'd *Spirit of Blood* being shaken, and thereby confounded with its *Oyl*, will quickly separate again from it, though with *Spirit of Wine* (which is according to the Chymists a *Liquid Sulphur* as well as the *Oyl*)
it

it will permanently unite, notwithstanding that these two Liquors do (to speak in their Language) belong even to differing *Kingdoms*, the one to the *Animal*, and the other to the *Vegetable*.

With the Essential Oyls (as Chymists call them) of Aromatick Vegetables, or at least with some of them the well Rectified Spirit of H. Blood seems to have a greater Affinity. For having taken a dram of this Liquor, and an equal weight of Oyl of Anise-seeds drawn in a Lembeck [*per vesticam*,] and shaken them well together they made a soft or semifluid White *Coagulum*, that continu'd in that form for a day or two, and probably would have longer done so, if I had not had occasion to proceed further with it.

It may not be impertinent on this occasion to take notice, that because I presum'd, that, though Spirit of Blood would not totally mix with Essential Oyls, (as Chymists call them)

them) it might either communicate some Saline parts to them, or work a change in them; I digested a while in a Glass with a long neck, some Rectified Spirit of Humane Blood, with a convenient quantity of Oyl of Anise-seeds drawn in a L embeck, and found, as I expected, that the Oyl grew colour'd of a high Yellow, and afterwards attain'd to a Redness; which Experiment I the rather mention, because it may possibly afford you a hint about the Cause of some Changes of Colour, that are produc'd in some of the Liquors of the Body.

Upon the foremention'd Affinity or congruity of the Spirit of Blood with that of Wine, and with (some) Essential Oyls, I founded a way of taking off the offensive smell of Spirit of Humane Blood, which is the only thing that is likely to keep the more delicate sort of Patients from employing so useful a Medicine, as this will hereafter appear to be.

But

But to deal with a Philosophical candor, I must not conceal from you, that, till Experience shall be duly consulted, I shall retain a Doubt, whether the way employ'd to deprive our Spirit of its *stink*, will not also deprive it of part of its *Efficacy*. But on the other side, I consider it as a thing probable enough, that these Aromatis'd Spirits may, by being impregnated with many of the finer parts of the Oyls employ'd to correct their Odour, be likewise endow'd with the vertues of those Oyls, which are Liquors that Chymists not improbably believe to consist of the noblest parts of the Vegetables that afford them.

To Aromatise the Spirit of Humane Blood we employ'd two differing ways, the first whereof was this; we took a convenient quantity of well Rectified Spirit of Blood and having put it into a Glass Egg, we added to it as much, or (what may in many Cases more than suffice)

half as much, Essential Oyl of Anise-seeds for instance; And having shaken these Liquors together to mingle them very well, we plac'd the Glass in a fit posture, in a Furnace where it should not have too great a heat, by which means the slight Texture of the *Coagulum* being dissolv'd, part of the Oyl (sometimes a great portion of it) appear'd by it self floating at the top of the Spirit. Whence being separated by a Tunnel or otherwise, the remaining Liquor was Whitish and without any stink, the smell predominant in it being that of the Anise-seeds, of which it tasted strongly, though the Saline Spirituous parts of the Blood did in this Liquor retain a not inconsiderable degree of their brisk and penetrant Taste,

The other way I thought of to Aromatise our Spirit of Blood, was by employing a *Medium* to unite it with Essential Oyls. For which purpose in a Vinous Spirit, so Dephlegm'd

phlegm'd that in a Silver spoon it would totally burn away, we dissolv'd by shaking a convenient proportion, as an eighth part or a far less (according to the strength of the Oyl) of an Essential Oyl (of Anise-seeds for instance,) and to this solution we added an equal quantity, or some other convenient one, of our Rectified Spirit of Blood, and having by shaking mix'd them as well as we could, we suffer'd the expected *Coagulum* (which was soft and not uniform) to rest for some time, after which it appear'd that some of the Oyl was reviv'd, and swam in drops distinct from the other Liquor, which consisted of a Mixture of the two Spirits, impregnated with the Particles of the Oyl they had intercepted and detain'd. This Liquor abounded with little concretions made by the concoagulation of the *Sanguineous* and *Vinous* Spirits. And these with a very gentle heat sublim'd in the form of a Volatile Salt, to the upper part of the Glass; Which

170 *The Natural History*

Which Salt seem'd to have a much less penetrating odour, then the meer Volatile Salt of Humane Blood, but had quite lost its *stink*, and yet retain'd a considerable Quickness, and somewhat of the scent of the Anise Seeds; the remaining Liquor also was depriv'd of its ill smell, and moderately imbued with that of the Oyl.

I thought it worth trying, whether there would be any Affinity between our Spirit (which I perceiv'd contain'd in it many latent Particles of an Oleaginous nature) and the highly rectified Oyl of *Petroleum*; which is a Mineral *Bitumen*: and having shaken together a Convenient quantity of these two Liquors in a new Vial, they presently turn'd into a White Mixture. And tho after it had for many hours been left to settle, the greater part of the Oyl swam above the Spirit, yet there appear'd betwixt the two Liquors a good quantity of a whitish Matter, which seem'd to be

be something that had been produc'd by the Precipitation or Union of many Particles of the Spirit and Oyl, that were more dispos'd than the rest to combine with one another.

The XIII. (Secondary) Title.

Of the Relation between Spirit of Humane Blood and the Air.

THat the Contact of the Air has a speedy and a manifest operation upon Humane Blood, is elsewhere shewn by some Experiments of an *Italian Virtuoso, Signior ----* and some of mine. But whether, after Humane Blood has had its Texture so much alter'd, as it uses to be by Distillation, it will retain any peculiar Relation to the Air, I have not been able to make Tryals enough to determine; but however it will not be amiss, to set down the chief Experiments I made on this occasion, because they may be considerable as parts of our History, tho they should not be so, as Arguments decisive of our controversy. The

The first Experiment was quickly made, by thinly spreading upon a piece of White Paper, (which ought to be close, that it may not soak up the Liquor) some small Filings of Copper, and wetting them well, without covering them quite over, with a few drops of good Spirit of Blood, for by this means being very much expos'd to the free Air, the Action of the Liquor was so much promoted, that within a Minute or two it did, even in the cold, begin to acquire a blewish colour, and in fewer Minutes than one would have expected, that colour was so heightened as to become Cereous. But when I put another parcel of the same Filings into a Vial, and cover'd them with Spirit of Blood, and then stop't the Vial, to keep it from intercourse with the external Air, the Liquor would not in some Hours acquire so deep a colour.

The other Experiment we made, in order to the lately propos'd enquiry,

quiry, was the same for substance, that I had formerly made, (and have elsewhere at large deliver'd) with the Spirit of Urine, and with that of Sal-Armoniac, save that, to spare our Spirit of Blood, we employ'd a far less quantity of it, then we did of either of the foremention'd Liquors. For having in a clear Cylindrical Vial of about an Inch Diameter, put more Filings of Copper than were requisite to cover the bottom, we pour'd upon it, but so much Spirit of Humane Blood, as serv'd to swim a Fingers breadth, or about an Inch above them. This Liquor, because of the quantity of Air, that was contain'd in the Vial, did within few Hours acquire a rich Blew colour, and this alter a day or two began to grow more faint, and continued to do so more and more, till it came to be almost lost; but yet the Liquor was not altogether Lymphid, or colourless, as I have often had it with Spirit of Urine, or
of

of Sal Armoniac ; which remains of blewishness I was apt to attribute to the great quantity of Air, that was included in the Vial with so small a quantity of Liquor. And tho I thought it not impossible, but that length of time might destroy these Remains of blewishness also, yet not having leisure to wait so long, I unstopt the Vial, and perceiv'd, as I expected, that in a very short time, perhaps about two Minutes of an hour, the Surface of the Liquor, where it was touch'd by the newly enter'd Air, became Ceruleous, and in a short time after, perhaps less than a quarter of an hour, the whole Body of the Liquor had attain'd a deeper colour than that of the Sky, which colour, the Vial being seasonably and carefully stop't, began in two or three days to grow paler again.

These Experiments would, I question not, to many seem manifestly to infer a great Cognation or Affinity (for I know not well what name to give

give it) between the Spirit of Humane Blood and the Air. But tho I shall not deny the Conclusion as 'tis an Assertion, I dare not rely on the validity of the Inference; because I have for curiosities sake made the like Experiments succeed, with other Spirits abounding with Volatile Salt. I foresee it may very speciously be pretended, that those Tryals succeeded upon the account of some Spirituous parts of the Blood, since Spirit of Urine is made of a Liquor separated from the Blood; and that, tho the Sal-Armoniack that is made in the East, may consist in great part of Camels Urine, yet that which is made in Europe, (where Camels are rarities) and is commonly sold in our Shops, is made of Mans Urine, and consequently its Spirit may well be presum'd to be impregnated with Spirit of Humane Blood. And I confess, that when this consideration came first into my mind, it appear'd so probable, that I should perhaps

perhaps have acquiesced in it, if it were not for what I am going to subjoyn; namely, That I found by Tryal carefully made, that with another Volatile Spirit made without any substance that is afforded by the body of Man, I could with Filings of Copper make an Experiment, very analogous to that above related. But because in *this* Tryal, the reiterated contact of the Air produc'd in the Liquor not a Ceruleous, but a Green colour, I am willing to suspend my Judgment about the Problem lately propos'd, till experience shall have further inform'd me.

I know not whether it will be worth while to relate, that having in an unslopt Glass, put some Spirit of Humane Blood into a Receiver, plac'd upon our Pneumatick Engine, and withdrawn the incumbent Air by pumping; the Spirit of Blood seem'd to afford lesser and fewer Aereal Bubbles, than such a quantity of Common Water it self would probably

bably have done. But, as I lately intimated, I know not whether this observation be considerable, because being not willing to weaken by exposing it, a fresh parcel of Spirit, I know not whether the paucity of Air observ'd in that lately mentioned, were accidental or not.

The XIV. (Secondary) Title.

Of the Hostility of the Spirit of Humane Blood to Acids, whether they be in the form of Liquors or Fumes.

THat there is in the Spirit of Humane Blood, such a thing, as a Chymist or a vulgar Philosopher would call *Hostility*, or an *Antipathy* in reference to *Acids*, has been plainly enough, tho very briefly, intimated in a Passage belonging to the third of the precedent Titles. But yet it may not be im-

N pertinent

pertinent to add in this place, that our Spirit of Humane Blood exercises this Hostility against more than one sort of Acid Spirits, tho perhaps they differ not a little from one another, as Spirit of Salt, Spirit of Nitre, Spirit and Oyl of Vitriol, *Aqua Fortis*, *Aqua Regia*, &c. and not only against *Facitious Acids*, but against *Natural* ones too, the Spirit of Humane Blood may discover a manifest Hostility, as I found by the conflict it would make with newly express'd Juice of Lemmons which it would put into a confus'd agitation accompany'd with bubbles. And this was yet the more evident, when I employ'd the Volatile Salt of Blood, that is, the Spirit in a dry form: for having squeez'd upon a parcel of this, some Juice of Lemmons, there was presently excited a great commotion, accompany'd not only with froth, but with noise. But (to return to the strongly Acid Liquors made by Distillation) whether the
great

great commotion, and froth, and hissing noise, that usually follows upon the mixing of Spirit of Humane Blood with any of these *Menstruums*, do proceed from a true Hostility, or an Antipathy deservedly so call'd, or else be a motion to Coalescence or Union; or an effect of the disturb'd motions proper to the differing, but now confounded, Liquors; or lastly, a consequent of some Impediment, which the new Texture of the mingled Liquors gives to the free passage of some Æthereal or other subtle Vermeating Matter or Fluid, I shall not take upon me to determine; but rather to what I lately told you, of the at least seeming contrariety of the Spirit of Humane Blood to Acid Spirits, I shall add (what perhaps you did not expect) that this Hostility extends even to the invisible *Effluvia* or Emanations of these Liquors, as may be readily seen by the following way, that I long since pitch'd upon to make

it not only visible but manifest

This is easily done by putting any strong Acid Spirit, as of Salt, or of Nitre, &c. into a Vial somewhat wide-mouth'd, and some well de-phlegm'd Spirit of Blood into another, for when I purposely inclin'd these Glasses so towards one another, that their Lips did almost touch, and their respective Liquors were ready to run out, *tho* neither of the Liquors did at all visibly fume whilst they were kept asunder, *tho* the Glasses were unstopt, *yet*, as soon as the Liquors came to be approached in the way just now mention'd, the Fumes meeting each other in the Air would make little Coalitions, which would be manifestly visible in the form of ascending Smoke, which was wont at first to surprize the delighted Spectators; and this production of Smoke would continue a good while, if the Vials were not sever'd to make it cease, which upon their remove it would presently do.

I have divers times practis'd a more easy way of making these Fumes conspicuous; but it belongs more to another Paper, and what has been now deliver'd may suffice for my present purpose.

Yet it may not be improper to take this occasion, to acquaint you with an Experiment that I made, to observe what the contrary Salts, that abound in our Spirit of Blood and in some Acid Liquors, would produce, when they were combin'd and brought into a dry form. I shall therefore annex a Transcript of the Experiment I speak of, as I find it registred in one of my Note Books.

[We took some pure Vo'atile Salt of Humane Blood, and having just satiated it with Spirit of Nitre, we slowly evaporated away the superfluous moisture, that the Acid and Urinous Salts might be united into a dry Concretion, from which my design was to separate them again, the Salt of Blood in its Pristine form,

N 3 and

and the Spirit of Nitre in the form of Salt-peter. To effect this, we put the compounded Salt into a small Bolt head with a long and slender neck, and then added to it a convenient quantity of Salt of Tartar, and as much distill'd Water as would suffice to make the Mixture somewhat Liquid, to promote the Action of the contrary Salts upon one another. By which mutual Actions we suppos'd, that the Saline Spirits of Nitre, being more congruous to the fix'd Salt than to the Volatile, would forsake the Salt of Blood, (which it detain'd before from flying away,) and give it leave to sublime; and accordingly having kept the Glass, wherein the mixture was made, for a competent time in a convenient heat, we obtain'd what we look'd for; since a good proportion of fine Volatile Salt ascended in a dry form, into the Neck.)

Having put to some of the Spirit of Humane Blood, a small quantity
of

of exceeding strong Spirit of Nitre, there was upon the conflict of the two Liquors excited so great a quantity of thick white Fumes, that I could not but wonder at it, having never seen any thing of that kind comparable to it. And these Fumes Circulating long in the Cavity of the Glass, whereof perhaps a tenth part was full of Liquor, did many of them, tho' the Vessel were wide-mouth'd, fall back and run down the sides of the Glass into the stagnant mixture, as if they had compos'd streams of a Milky Liquor. And when at length, after these Fumes had disappear'd, we dropt in a little more of the same smoaking Spirit of Nitre, the like strange plenty of white Exhalations did presently ensue, and continue to Circulate a great while in the open Glass, the Mixture in the mean while appearing reddish. Being settled, and seeming to have been so discolour'd by a fattish substance, we put to it a

little Rain or Distill'd Water, and having by Filtration separated it from the *Fæces*, and slowly evaporated the thus Clarified Liquor, the Saline parts shot into Crystals much of the shape, and crossing one another much after the manner, of *Striæ* of Salt peter; but their colour after a while appear'd Yellow, as if some Oily substance were yet mix'd with them.

N. B. Tho on several occasions the Spirit of Blood appear'd thus Oily, yet I remember I had not long since some Distill'd from another parcel of Blood, which after having been kept a year, was limpid and colourless like an ordinary Vegetable Spirit.

Some of the forementioned Crystals being put upon well kindled Charcoals, did presently melt and burn away with a noise not unlike Salt-peter; but the flame seem'd not quite so halituous, and was more differing in colour, being not at all Blew but very Yellow. After the
de-

deflagration was quite past, I was curious to see if any fixt substance was left upon the Coals, and found it to be somewhat odd; for it was not of a light colour, nor of an incoherent Body, like Ashes, but a little lump of a dirty colour'd matter, in which I could not perceive an Alcalisate tast, and indeed scarce any at all. And this brittle substance (for such it was) being held in the flame, became red hot, without appearing destroy'd by that Ignition, no more than afterwards it did by being a good while kept upon a glowing Coal.

The

The XV. (Secondary) Title.

*Of the Medicinal Vertues of Spirit
of Humane Blood outwardly ap-
ply'd.*

HAVING resided for many years
last past, in a place so well
furnished with learned Physicians as
London is, I was careful to decline
the occasions of entrenching upon
their profession. And tho that care
did not always secure me quiet, yet
it did it so far, as that you, to whom
my circumstances are not unknown,
will not I hope expect, that I should
say much upon my own experience,
of the Medicinal Vertues of Spirit of
Humane Blood; yet since I had
some few opportunities to get Try-
als made by practitioners in Physick,
(who were pleas'd very willingly to
make them for me,) that I may
not

not leave this Subject wholly untouch'd, I will subjoyn what occurs, either to my Memory, or to my Thoughts, about it.

When I consider, that, as far as I have observ'd, we do not meet regularly with any *Acid* Substance, (except perhaps in the *Succus Pancreaticus*) in a sound Humane Body: For the fixt Salt of Blood does it self much resemble Sea-salt, whether its Spirit be Acid or no; whereas the several parts of it, whether *Solid*, as Bones, or *Liquid*, as Blood, afford in Distillation store of Liquor impregnated with Volatile Salt; I am induc'd to think it probable, that the Spirit of Humane Blood, wherein such a Salt abounds, and whereof it is the main and predominant Ingredient, is like to have notable operations upon the Humane Body, and afford Medicines of great Efficacy in many of its Diseases. And, tho against most of these it is to be internally given, yet there are some
against

against which it may be successful, when but *Externally* administred.

For, as well rectified Spirit of Humane Blood abounds with very subtile Particles, which in point of Taste, Odour, Diffusiveness and Penetrancy, do much resemble those of strong Spirits of Urine, of Harts-horn, and of Sal-Armoniack; so one may very probably expect to find the same vertues in the Spirit of Blood, that Experience has manifested to belong to those other Spirituous Liquors.

I have seldom, if ever, seen any Medicine operate so nimbly in Fits of the Mother, as a well dephlegm'd Spirit of Sal-Armoniac; which as I formerly noted is in effect mainly a Spirit of Urine; which it self is granted to be, a Liquor separated from Blood: for this Spirit being held to the Noses of Hysterical Women, has often in a trice, to the wonder of the By-standers fetch'd them out of their Fits. Nor is this the considerablest effect that I have had

had of this Spirit, for sometimes it has with a strange quickness brought to themselves Patients that were fallen to the ground, and either really were, or were judg'd to be, Epileptical. And even in Agonizing Persons, where it could not recover them, it would frequently for the time, bring them out of their swoons, and make them know and understand the Assistants, and perhaps speak to them too: of which, if it were needful I could give more than one instance. But I shall rather add, that if nature be not quite spent, and the case wholly desperate, this may be of great advantage, because it allows the Physician some (tho perhaps but little) time, and a good opportunity to administer other Remedies which the Patient, unless excited and brought to himself, would not be made to take. Of which I shall give you a memorable instance in a Patient of the very learned Dr. *Willis's*, who being in
the

the Fitt of an Apoplexy, when he was necessitated to go from her out of the Town, and leave her in that Condition, he Committed her to the care of a very Ingenious Physician, who (whether by his direction or no, I remember not) came to me to acquaint me with it, complaining that they could not hope for any success of their Remedies, in regard she was so stupid, and had shut her mouth so, that they could not get any down; whereupon I gave him, and told him the use of, a very subtile Spirit that I had by me for such cases, tho I remember not, whether it were of Sal armoniac, or some other Volatile and Liquid Alcaly; by applying which to her Nose, the Physician found he could presently make her open her Eyes, and in part come to her self; but then she would again, when the Glas was remov'd, soon relapse into her former Condition. Wherefore having by those frequent Vicissitudes gain'd some time,

time, and got a Medicine for his purpose he then held the glass to her Nose for a good while together; by which means she so recovered her senses, that she knew the By-standers, and being exhorted to take a Medicine that was offered her, which they told her would do her much good, she understood them, and swallowed it; and tho afterwards, upon the removal of the Vial, she relaps'd into a senseless state, yet by the help of the Urinous Spirit they kept her alive, till the very brisk Medicine she had taken began to act its part, and make a Copious Evacuation, which did not only rouse her, but little by little relieve her; So that in a short time she happily escap'd a danger, that was judg'd to be very hardly, if at all, superable by any Medicines. But here I must give you notice, that in such difficult and desperate Cases I am not content that a Vial with a somewhat long neck be held to the nose, but sometimes order that little Pellets

Pellets of Lint or Cotton, or of thin rags, be dipt into the Spirit and thrust up into the Nostrils And the same thing I would advise, if need should require it, in the administration of Spirit of Humane Blood. And as, for external uses, I make a particular Preparation of Spirit of Sal Armoniac, or of Urine, that is more strong and penerant, then that which is made the more ordinary way : So, if I had been furnish'd with store of Spirit of Blood, I would have handled it in a not very unlike manner. And however with the little I had, I made the following Experiment, for Tryals sake We took some dry'd Volatile Salt of Humane Blood, (being then better able to spare that than Spirit,) and put to it as much Spirit of Nitre, as would just serve to satiate it ; and then by Evaporation we obtain'd thence an Anomalous kind of compounded Salt, which afterwards, because we desired a Medicine in a dry form, we sublim'd
from

from a Convenient quantity of a well chosen *fixed Alcaly*, (if I mistake not, we took an equall weight of *Salt of Tartar*) fit to retain, not only the Phlegmatick parts, but the Oleaginous too, which oftentimes lye conceal'd in Volatile Salts and Liquors, wherein they do not at all at first appear, and unto which the greatest part of their fœtid or offensive smell may probably be imputed. By this means we obtain'd a dry white Salt of a very piercing smell. But I had no opportunity to try this sublim'd Salt upon diseased Persons: for whose sake, I also made use of another way to bring over the Saline part of Blood in a *Liquid* form, (which for the use of smelling I for the most part prefer to the *dry*) for which purpose we mix'd two parts of dry'd Humane Blood, with three parts of Lime, and then distill'd them with a pretty strong Fire, by which means we obtain'd, as we expected, a pretty deal of Spirit unaccompanied with any Volatile Salt in a dry
O form,

form, which Spirit seem'd, even without Rectification, to have a stronger smell, and a more fiery tast then other Spirit of Blood, after a Rectification. And I guess'd that if we had taken more or stronger Lime, we should have had less Oyl, and a more piercing Spirit, since the Lime would probably have retain'd most of the Oyl, and perhaps all the Superfluous Moisture.

I have likewise often found, that slighter Head-aches have been cured in less (and perhaps much less) time than a quarter of an hour, by the base smell of some of these well depurated Volatile Alcalies; and if I misremember not, I have been relieved particularly by that of *H. B.*) and I have very rarely for these many years us'd, or (thanks be to God) needed any other Medicine to free my self from pains of the Head. And even Violent and durable pains of that part have been, if not quite remov'd yet much lessen'd, by the same remedy often reiterated, which I have likewise

likewise observ'd to be usually enough very effectual in faintings, especially those of Hysterical and Hypochondriacal Women; which makes it probable, that our Spirit of Humane Blood, which is a Liquor that in many Qualities manifestly resembles other Volatile Alkalies, (and perhaps surpasses them,) and which, when well freed from its Oyl, can by few, if by any, be distinguish'd from other Urinous Spirits, may by its odour be available in the forementioned Maladies. I expect you should tell me, that the ill scent of Spirit of Blood will hinder that sex from using it externally, to divers of whose Distempers it is the most proper. To this it may be answer'd, that most of those that find themselves in pain or danger, would be content to be eas'd or rescu'd by an unpleasant Medicine. For we may apply to health, what *Vespasian* said of the Tax that was paid him, upon the score of Urine, *Lucri bonus odor ex re qualibet.* And

accordingly we see, that Ladies themselves ordinarily make use in such Cases of burnt Feathers, and in these and some others of *Castoreum*, *Galbanum* and *Asafætida*, whose smells are offensive enough to men. But for the more delicate and Nauseous Patients, one may much lessen the offensive odour of our Spirit, by long Digestions, or by reiterated, or skillful Rectifications. And if even then they cannot be reconcil'd to the odour of so good a Remedy, that odour may (as was formerly intimated on another occasion) be corrected by uniting it with a Convenient quantity of highly rectified Spirit of Wine; by which means it may perhaps (for I am not sure on't) lose somewhat of its penetrancy, as well as of its Urinous odour, but yet may remain subtile and active enough for divers good purposes. And if you would not only correct the smell of the Spirit of Blood, but make it afford a fragrant one, you may do it by dissolving in the Spirit of
Wine

Wine a convenient quantity of some Aromatick, or other well scented, Chymical Oyl, whose proportion may be found by letting it fall drop after drop into the Vial, and frequently shaking it to mingle the Liquors well, till you find by your smell, That the offensive odour of the Spirit of Blood is sufficiently obscured; or (if you will not only correct it, but perfume the Liquor) that the mixture is sufficiently imbued with the grateful Odour of the Oyl, wherewith you compounded it.

I shall add on this occasion, that, if we aim chiefly at correcting or changing the smell of Spirit of Blood, we may usefully employ a Chymical Oyl, more mild or temperate than the Aromatick ones of Cinnamon or Cloves. For Tryal purpose-ly made has inform'd me, that, if the Oyl of *Rhodium* (which is much esteem'd by perfumers) be sincerely and skilfully made, (which I fear it is not over frequently) a very few

drops of it will make an ounce of Alcohole of Wine so fragrant, that this Solution being shaken together with a convenient quantity (perhaps much less than an equal one) of well rectify'd Spirit of Humane Blood, there will emerge a mixture, that I found to have a scent brisk enough, and yet to be not only free from stink, but imbu'd, tho not strongly, with the Odoriferous Particles of the *Rhodium*.

I must not here omit, that divers happy Practitioners, as well Physicians as profess'd Chymists, do highly extol the Oyl of Amber, against Convulsion fits and other Distempers of the Brain and *Genus Nervosum*: And indeed Experience has so recommended *some* Medicines of Amber to me, that in some cases there are few that I more willingly give or take. And besides the great Character that *Helmont* has left of Amber dissolv'd in Spirit of Wine, Experience has brought such Credit
to

to it in divers cases, (for there are some cases and constitutions wherein I suspect it of too much heat) that many Patients, as well Women as Men, had much rather endure the smell, than deny themselves the benefit of the Tincture or the Oyl. And if you have any such Patients, perhaps you will not be ill pleas'd to be advertiz'd, that you may according to the formerly mentioned way, employ the high Tincture of Amber taken with Spirit of Wine; to correct the Odour, and encrease (at least in number) the Vertues of Spirit of Humane Blood. And because it requires some skill, and not seldom a pretty deal of time, to draw this Tincture from Crude Amber, tho' finely powder'd, I be-thought my self of the following way, to draw speedily a strong Tincture from the Oyl it self; for, tho' this Oyl will not, even by long shaking, dissolve thoroughly in Spirit of Wine, as the Aromatick and other

O 4

Oyls

Oyls lately mentioned will do ; yet I found that by well shaking those two Liquors together, and leaving them to settle at leisure; tho they would separate into distinct Masses, yet the Spirit of Wine would even in the cold extract from the Oyl a fine Tincture of a high Yellow colour, little, if at all, different from that of the Oyl it self. Of which Tincture I afterwards mix'd as much with Spirit of Blood, as suffic'd to obscure the Urinous smell, and make that of the Oyl of Amber somewhat predominant, and as we judg'd, more subtil and brisk than it was before.

Three things more I have to intimate concerning the external use of our Spirit of Blood. The first is, that by what has been said of the good effects it may have, when (after it has been, by the lately mentioned or other preparations, imbu'd with Chymical Oyls) it is smelt to, I would by no means be thought to deny, that it is after these changes
fit

fit to be also inwardly employ'd, as I shall have ere long occasion more particularly to declare. My second Admonition shall be, that, whereas in some mixtures it will be hard to hit upon the proportion of the Chymicall Oyl, or other things employ'd to correct the smell of the Spirit of Blood, so exactly, but that after the mixture has had some time to settle, a separation of some oleaginous parts will be made: The bulk of the mixture may be freed from it, by pouring all into a Glass Tunnel somewhat sharp at the bottom, after the manner us'd among Chymists to separate Oyls from other Liquors, and then the mixture that will run through before the Oyl, may be kept close stop'd in a Vial by it self, and the fragrant Oyl (unless it be of Cinnamon or Cloves) reserv'd for other uses. And whereas frequently, if not most commonly, if the Vinous Spirit were sufficiently Rectified, there will, by the Concoagulation
of

202 *The Natural History*

of the Saline and Urinous Particles, be produc'd a kind of Salt; you may either pour the Liquid part from it into another Vial, and use each of them separately without more ado, or else without thus separating them, you may sublime with a very gentle warmth, as much as will ascend from the rest of the Mixture in a dry form. And this *Sal Volatile Oleosum* of Spirit of Blood, when it was duly prepar'd, I found to be depriv'd of its former bad scent, and perhaps endow'd with a fragrant one, and yet to have an Odour more subtile, brisk, and piercing, than I had thought it reasonable to expect. The third and last thing I would advertise, is, that besides those Medicinal uses, that may be made of the Odours of Spirit of Blood Simple or Compound'd, it may have considerable Vertues, apply'd in substance as a Liquor, by way of Fomentation or otherwise; which I think the more likely, because

cause the Spirit of Sal-Armoniac has been much commended, for mitigating the sharp pains of the Gout, and is said to have been successfully us'd in the *Erysipelas*. And when I consider, that our Liquor is very Spirituous and Penetrating, and so fit to strengthen and resolve, and also of an Alcalisate nature, which fits it to mortify Acidities, it seems very probable, that, by vertue of these and other friendly Qualities, it may, by being apply'd in its Liquid form, prove good in divers cases, where the Chyrurgions or the Physicians help is wont to be requir'd.

But 'tis high time for me to proceed, from the External to the Internal uses of the Spirit of Humane Blood,

The XVI. (Secondary) Title.

Of the Medicinal Vertues of Spirit of Humane Blood inwardly us'd.

I Have long been prone to think, that 'tis not necessary the number of specifically different *Morbific Matters* (as Physicians call *actually noxious Humours* or other substances) in the Humane Body, should be near so great as that of the *Diseases* 'tis obnoxious to; and consequently, that every *Disease*, that has a distinct *Name* assign'd to it, does not always require a distinct sort of *Peccant Matter* to produce it; but that the same hurtful *Humour*, or other *Agent*, may produce sicknesses that pass for differing ones, (and accordingly have distinct Denominations) only as the same *Morbific Agents* had effects

effects are diversity'd, *partly* by its own greater or lesser quantity, and more or less active Qualities, and *partly* (and indeed *chiefly*) by the particular Natures, or Structures and Situations, of the parts that it invades. To this Opinion I have been led by divers Inducements, that I shall not now stay to set down; especially, since the probability of it may be easily deduc'd, from what frequently enough occurs among sick persons, of the *Metastases* of Morbific Matters; the same Acid or Sharp Humour, for instance, producing sometimes a Colic, sometimes after that a Palsey, sometimes a Cough, sometimes a Flux of the Belly, sometimes an *Ophthalmia*, sometimes a violent Head-ach, sometimes Convulsions, and sometimes other Distempers; as the Peccant Humour, or other Noxious Matter, happens primarily to invade, or afterwards to be translated to, this or that particular part of the Body. And to the hitherto propos'd

pos'd Notion 'tis very agreeable, that one Remedy, by being capable victoriously to oppugn one or two of the principal kinds of Morbific Matter, may be able to cure differing Diseases; especially if it be endow'd with any variety of active Vertues. And upon this ground I am apt to think, that the Spirit of Humane Blood, skilfully Prepar'd and Administred, may be a good Remedy in no small number of Internal Affections of the Humane Body. And indeed Volatile Alcalies in general, have been in *England* so prosperously made use of in Physick, since the year 1656, (about which time I had the good fortune to contribute so to introduce them, as to bring them by degrees into request, by divulging easy ways of making them, as well as by declaring their Vertues) that I see small cause to doubt, but that they will hereafter be more generally esteem'd and employ'd, than yet they are, and will little by little
invite

invite Physicians to prefer them to a great many vulgar Remedies, that for want of better are yet in common use, tho they clog or weaken the Patient, and want divers advantageous Qualities that may be found in Volatile Alcalies. For (to apply what has been said to our present Subject, as an instance that may serve for other Urinous Spirits) the Spirit of Humane Blood is endowed with divers Qualities, that are both Active and Medicinal. For it mortifies Acid Salts, which are the causes of several Diseases, and, if I mistake not, of some that are not wont to be imputed to them. It is a great Resolvent, and on that score fit to open Obstructions, that produce more than a few Diseases. It is both Diaphoretick and Diuretick, and on both these accounts fit to assist Nature, to discharge divers Noxious Salts, and expel divers Contagious or Malignant Corpuscles that offend her. It resists Putrefaction and Coagulation of the
Blood,

208 *The Natural History*

Blood, gives it a briskness and Spirituosity that promotes the free Circulation of the Blood, to which it is Congeneal; by which means (tho not perhaps by these only) it becomes a good Cordial, and probably against some Poysons an Antidote. And, which is none of the least, nor least extensive, Vertues, it is very friendly to the *Genus Nervosum*, and upon that account is like to be very proper in *Fits of the Mother* (as they are call'd,) *Convulsions*, some sorts of *Head aches*, *Palseys*, *Incipient Apoplexies*, some sort of *Asthmas*, &c. It is also *Balsamical* in some Circumstances, and may have divers other Vertues that have not yet been observ'd. For a Medicine that does not weaken, nor cause great Evacuations, nor clog the Stomach, nor is blemish'd with the excess of any manifest Quality, but has in it self a Complex of so many useful Powers, may reasonably be suppos'd, likely to be available in more than

a few Diseases; since a good part of those that Humane Bodies are lyable to, may be powerfully oppugn'd by some of those excellent Qualities, one or more, whose Confluence may be found in the Spirit of Humane Blood.

I presume therefore that one may rationally propose it, as liely to be a good Remedy in many Distempers, especially wherein either Spirit of Urine, or the Urinous Spirit of Sal-Armoniac, have been found successful Medicines; such as Hysterical Fits, Pleurifies, Coughs, some Scorbutick Distempers, Convulsions, Apoplexies, some kinds of Feavers, Head-aches, the Jaundise, &c. But I formerly prepar'd you not to expect that I should say much of the Virtues of the Spirit of Humane Blood (inwardly given,) upon my own personal experience. And therefore I shall not scruple to tell you, that *Helmont* himself, as little as he is apt to praise other than his own

or the Paracelsian *Arcana*, more than once commends the Spirit of *Cruor*, though that be in his sense of the Word, not yet fully elab-

Spiritus Vitæ
N. 16. Pag.
M. 122.

borated Humane Blood) against the Epilepsy, which he says it will cure even in adult persons, which is a Vertue he expressly denies to the Spirit of Urine. And a famous Writer about the Hermetick Physick (but, if I mistake not, better vers'd in divers other parts of Learning, than in Chymical *Arcana*,) tho he so far depretiates Spagyricall Preparations, as to commend the Utility but of a very few of them, is pleas'd to put the Distill'd Liquor of Blood into the number of those very few that he vouchsafes a good Character to.

I am the more inclin'd to give Credit to these praises of Spirit of Blood, because, as I remember, this was the Medicine that I made use of in the following Case. A young Lady,

Lady, in whose family the Consumption was an hereditary disease, was molested with a Violent and Stubborn Cough, that was judg'd consumptive, and look'd upon by those that gave her Physick, as not to be cured by any other way, then a seasonable remove from *London* into the *French* Air; but she was already so far gone and weakened, and there remain'd so much of the Winter, that 'twas judg'd she would die before the season would make it any way fit for her to undertake so long and troublesome a journey; but if she could be kept alive till the end of the Spring, there would be some hopes she might in *France* recover. On this occasion being solicited by some friends of hers and mine, to try what I could do to preserve her, I sent her some Spirit of Humane Blood very carefully prepar'd and rectify'd, (to which I gave some name that I do not well remember,) upon the use of which she manifestly

mended, notwithstanding the unfriendliness of the Season; insomuch that about the end of *February*, she had gain'd relief and strength enough to venture to cross the Seas, and make a journey to *Montpellier*, whence in *Autumn* she brought home good looks and recovery. If I much misremember not, the same Spirit of Blood, made very pure and subtile by the help of a Lamp Furnace, was the Medicine that I put into the Hands of an Ingenious and Successful Physician, who complain'd to me that he had a Patient, that had quite puzzled him, as well as baffled the endeavours of other eminent Doctors, whom the difficulty of the case had invited at several times to try their skill upon him. This man was frequently Obnoxious to such violent and tormenting fits of the Head-ach, that he could not endure the light, and was offended with almost every noise or motion that reach'd his Ears; insomuch
that

that he was forc'd to give over his Profession, which was that of a Taylor: But upon the constant use of the before mentioned Spirit of Blood, (for the other Medicines he took were much inferior to it, and had not before been available) he received such relief, as made him with great joy and thankfulness return to the exercise of his Trade, and the Physician, to whom I gave the remedy for him, told me one circumstance, too considerable to be here omitted. Namely, That the Patient having by our famous *Harvey's* advice, been us'd to bleed once in two or three Months, the Physician counsell'd him, notwithstanding his recovery, not abruptly to break off his ancient custom, and the Patient thereupon sent for the same Chyrurgeon that had been formerly wont to let him Blood, and to complain of the great badness of his Blood; but when this Chyrurgeon who knew not what had been done to the Patient,

came to open a Vein again, and perceived what kind of Blood it afforded, he was so surpriz'd, that he stop'd the operation, and asked the man with wonder, how he came by such Florid Blood, adding, that 'twas pitty to deprive him of so well conditioned a Liquor.

The Medicinal Vertues hitherto mentioned belong to the Spirit of Humane Blood, as 'tis pure and simple: But 'tis not improbable that it may acquire other, and perhaps nobler Faculties; if it be dexterously corrected, diversified, or united with fit Ingredients, that is, in a word, skilfully altered or compounded.

These things may be performed several ways. For they may be done either by uniting as well as one can, by long digestion, or frequent Cohobations, the Spirit of Humane Blood with the Oyls, Salt, and (if need be) Phlegm, of the same Concrete, into such a kind of Mixture as some *Chymists* call *Clyffus*.

Or

Or, 2. By uniting the Spirit of Blood with Acids, as with Spirit of Nitre, Spirit of Vinegar, Spirit of Verdegrease, Oyl of Vitriol, &c. and employing these mixtures, either in their Liquid form, or reduced by Evaporation into Chrystals or other Salts; and making use of these either as they are, or after a kind of Analysis of them.

Or, 3. By uniting our Spirit with Metalline Solutions, as of Gold, Silver, Mercury, and with Solution of Minimum made with Spirit of Vinegar, by mixture of which Liquor with Spirit of Blood, and a slow Evaporation of them, I remember I have had pretty store of finely figured Chrystals.

Or, 4. By dissolving in Spirit of Blood carefully Dephlegm'd Sulphur opened with Salt of Tartar.

Or else, By dissolving in it some Metalline Bodies, as Copper, Zink, and Iron, which last will afford a Martial Liquor, that differing much

216 *The Natural History*

from other preparations of Steel, that are wont to be made with Acids, may probably have some Vertues, distinct from those of the known Remedies made of that Metal.

But I cannot stay to enumerate the several ways whereby the Spirit of Humane Blood may be made serviceable to the Medicinal Art. Yet one Preparation there is, which tho I have already taken notice of in the foregoing Title, and therefore can scarce mention without some repetition, yet I think I ought not to pretermitt it on this occasion; *partly* because whereas it was formerly propos'd with respect only to the *outward* uses of it, I shall now consider it with reference to the *inward*; and *partly* because by this way of proceeding we may at once correct, diversifie and compound our Spirit of Blood.

This Operation may be perform'd two ways, whereof the former is *more* simple than the latter. The first

first is, to add to well Rectify'd Spirit of Blood, a double weight, or about an equal one, (as the Liquors, especially the Volatile Alcaly, are more or less strong) of Alcohole of Wine. For these Liquors being well shaken together, will in very great part coagulate into Salt, which with a very gentle heat will sublime in a dry form, + in which I found it to have lost almost all its offensive smell. And tho against this way of proceeding I know it may be objected, (as was formerly intimated) that the efficacy of the Medicine may, as well as the Urinous smell, be much weakned by this Preparation; yet I found this Salt to retain a considerable degree of Quickness and Penetrancy, which its Volatility kept me from thinking strange. And experience has perswaded me, that divers of these compounded, or, if I may so stile them, Resulting Salts, (which some Chymists call *Salia Enixa*, for all agree not

218 *The Natural History*

not in the Sense of that name) tho they seem to have their Activity clog'd, may have considerable operations both in Chymistry and Physick. And why the Emergent Salt we speak of, may not be of that number, I see no sufficient cause; (N. B.) especially since such a kind of Mixture, tho made with another Urinous Spirit, has had such effects in Feavers, as I thought extraordinary. Nor is the Liquor that our Compounded Salt leaves behind, to be thrown away: since if it be Dephlegmed, it may afford a not Despicable Liquor, both for Medical and Mechanical uses, of which it may here suffice to have given you in general this hint.

And if the more simple way of altering the Spirit of Humane Blood, be carry'd on a little further, by dissolving in the Alcohole of Wine, before the conjunction of the two Spirits be made, a convenient proportion (as perhaps a Twentyeth or
Twenty-

Twenty-fourth part) of an Essential Chymical Oyl, as of Cloves, Anise-seeds, Marjoram, &c. the Volatile Salt that will be sublim'd from this Mixture, will not only be depriv'd of its stink, but endow'd with the smell and the Relish of the Oyl; which by being thus united with a Salt very subtile and friendly to nature, will less overpower and offend the Brain and Stomach, than meer Chymical Oyls are wont to do; and being associated with such Agile and penetrating Corpuscles, will with them gain admission into the more inward Recesses of the Body, and there exercise the Vertues that belong to the Vegetables that afforded the Oyls, or at least to the Oyls themselves. In these odoriferous Aromatick Mixtures the Oleaginous Particles are, by the intervention of the Saline ones, brought to mix readily with other Liquors, and even with Aqueous Vehicles, and to continue long enough mix'd, for the Patient

220 *The Natural History*

Patient to take them commodiously. And thus by this one method there may be a multitude of *Salia Volatilia Oleosa*, that is, of pleasing, subtile and efficacious Remedies for inward uses, prepar'd, even as many as the Physician or Chymist shall please to make Essential Oyls, (or others that will dissolve in Alcohole of Wine;) and if these be drawn from Cephalick Plants, as Marjoram, Rosemary, Lavender, &c. or from Cephalick Spices, as Nutmegs, Cinnamon, &c. they will probably afford very brisk and grateful Medicines to relieve and comfort the Brain and Spirits; as they may the Heart, Liver, and other *Viscera*, if in the sublimation the Saline Particles of Blood be associated with those of Oyls, drawn from Vegetables whose Vertues do peculiarly respect those parts.

Other ways might be here propos'd of making Remedies, whereof the Spirit of Blood should be the main ingredient. But I willingly leave

leave that work to your self, and those of your profession, if you think fit to prosecute it ; since my present task does not require that I should write like what I am not, a profess'd Physician, but like what I endeavour to be, a Diligent Natural Historian. And for the same reason I purposely forbear, to insert here some Chymical processes that I have met with of Remedies that admit of Distill'd Blood, tho I have also declin'd the mention of them for two other Reasons, *one*, that the Authors do not recommend them upon their own Experience, and the *other*, that these Medicines being much more compounded than those I lately propos'd, wherein our Spirit is mingled but with some one Chymical Oyl or *ether*, diluted with Alcohole of Wine ; their preparations are less fit for my Design ; which leads me to consider the Effects of Humane Blood upon Patients, less as they are Sanative, than as they are Signs
of

222 *The Natural History, &c.*

of Qualities, whose knowledge tends to the discovery of the Nature of Spirit of Humane Blood, and so of that of Blood it self.

And this, Sir, it may suffice to have at present set down, touching the *History of the Spirit of Humane Blood*; of which, and of the other parts constituting that Red Body, or obtainable from it, I might have given you a far less incomplete Account, if I had had more leisure; and if, for want of Materials to make Experiments upon the entire Liquor, and the Concreted and Serous Parts of it distinctly, and especially to afford a sufficient quantity of the Spirit, I had not been so straitned that I was fain to leave many things untry'd, and to try some others in much less quantities, and much more unaccurately than otherwise should have been done by,

Sir, your, &c.

A N

AN
APPENDIX
TO THE
MEMOIRS
FOR THE
HISTORY
OF
Humane Blood.

HAVING elsewhere mentioned the Reasons that mov'd me to think it fit to subjoyn an *Appendix* to each of the Natural Histories, that I drew up, or design'd, of particular Subjects; it would be needless to

to trouble you with them in this place, where it may therefore suffice to advertise you, that the following Particulars I have thrown together as they occur'd to me, to be annexed to the foregoing History of Humane Blood, are made up of two sorts: *Some* which through haste or otherwise were *Prætermitted*, when they should have been rang'd under one or other of the foregoing Titles, and so are answerable to those, that in the First Part of these Memoirs were call'd *Paralipomena*; and *others* that are for the most part of kin to those, that are there stil'd *Addenda*; tho some of them may be judg'd to deserve better the name of *Supernumerary*, which yet I thought fit to let pass among the rest, because, tho they do not directly belong to any of the distinct Titles of our History, yet they may obliquely be refer'd to one or other of them, or are at least capable of being made some way subservient
to

to the general Design of the History it self. But the paucity of the particulars that I am at present furnished with, makes me fear it may favour of Ostentation, if in so much penury of matter I should curiously refer the Particulars that now occur to me to the differing Titles, Primary and Subordinate, that have been enumerated in the Schemes of our intended Histories. And therefore, till I be better stock'd with materials, I shall forbear to make Scrupulous References of them, or so much as constantly distinguish the *Paralipomena*, from the other *Addenda*: contenting my self to refer some of them in a general way, and in the order they Chance to come to hand, to that part of the Memoirs, whether the Second, the Third, or the Fourth, to which they respectively seem most to belong.

'Tis hop'd that neither Connection nor style will be expected. in loose Notes hastily set down at several

Q

ral

ral times, to secure the Matters of fact, then fresh in Memory, from being, as to any necessary Circumstances, forgotten.

Some Tryals may seem to have been made extravagantly and quite at random, which perhaps would be otherwise thought of, but that I judg'd it not worth while, especially writing in haste, to spend time in setting down the Inducements I had to make them, or the Aims I had in them.

I am well aware, that some few of the following Tryals may seem but Repetitions of others, recited in the Body of the History. But these were added on purpose, that *where* the Event of both Tryals was the same, they might confirm one another, which, where the subject has lain uncultivated, is oftentimes a desiræable thing; and *where* they disagree in any considerable Circumstances, their Difference may occasion further Tryals, and in the mean

mean time keep us from building
Dogmatical Conclusions upon the
Circumstances wherein they differ.

*Particulars referable to the Second
Part of the History.*

Experiment. I.

THe Proportion of the substances
obtainable from dry'd Humane
Blood, being as I formerly noted,
very difficult, to be determin'd, be-
cause of that Difficulty, and the Im-
portance of the Inquiry, I thought
fit to employ some Blood, that I
made a shift to collect since the wri-
ting of the Second Part of the fore-
going History, in making another
Experiment, that we may make the
nearer and safer estimate, of the
Quantities of the distinct substances
sought after. For this end I caus'd

Twelve Ounces of dry'd Blood to be carefully distill'd by an expert Laborant, well admonish'd of the Difficulty of his Task, and the exactness he was to aim at in performing it. The Distillation being ended, the substances obtain'd were brought me, with this note of their Quantities. Twelve Ounces of dry'd Humane Blood yielded, of Volatile Salt and Spirit together five Ounces, of which we pour'd off from the wet Salt $3xii\text{ij}+$. 54 . gr. So that their remain'd $3ij+$. $3ij+$. 6 . gr. Of Volatile Salt; of fatid Oyl there were two Ounces, of *Caput Mortuum* four Ounces, and two Drams. So that in spite of all his care there was lost, by sticking to the Retorts and other Glasses (which I presum'd, retain'd little else than the more viscous Oyl and phlegm,) and by avolation of some more subtil parts (especially upon pouring the Liquors from Vessel to Vessel,) about Six Drams. The four Ounces and two Drams
of

of *Caput Mortuum* being diligently calcin'd, afforded but Six Drams and a half of Ashes: Of which very great Decrement, the Accension and Consumption of the more fixed Oleaginous Part seems to be the cause. And if it be so, we may suppose, that there is a far greater portion of Oyl, in Humane Blood, than has been hitherto taken notice of. These Ashes were not white or Gray, as those of other Bodies use to be, but of a Reddish Colour, much like that of Bricks; and yet the watchful Laborant affirm'd, he could easily know them to be true Ashes, because that whilst there remain'd any thing Oily or Combustible in the *Caput Mortuum*, it would look like a thoroughly kindled Charcoal (which it would continue to do far longer, than one would expect:) But when that Combustible substance was quite wasted, the remaining *Caput Mortuum* would look in the fire like dead and ordinary Ashes, tho, when they

were Cold, they appear'd and continued Red. These Ashes being carefully Elixivated, afforded five Scruples of White fixt Salt, besides a little, which being casually got into the Contiguous sand, and thence recover'd by water, and reduc'd to the like White Salt, amounted to about a Scruple more. So that their remained for the *Terra damnata* Fourteen Scruples & about a half, that is, a good deal above twice the weight of the Salt, whence it appears, that according to this *Analysis*, the pure fixt Salt of Humane Blood is but between the 57th and 58th part even of dry'd Blood, and therefore probably amounts but to the 150th or perhaps the 170th part (in weight) of Blood, as it flows from the Vein opened by a lancet : and the Fixt Earth or *Terra damnata*, is to the dry'd Blood that affords it, as 19. and about a half to 1.

Experi-

Experiment II.

IN regard the foregoing Experiment, and another of the like nature formerly mentioned were made with dried and pulverable Blood of several Persons put together, though I knew it would be scarce possible, in so small a quantity of Blood, as I could obtain at once from one Person, to find out with any accurateness, the quantities of the several substances, it was capable of affording; yet, to be able to make some tolerable estimate grounded upon experience, I was invited to make a tryal, whose success, though in one part of it unlucky, was registred as follows.

An entire parcel of Humane Blood weighing ten ounces and 73 gr. being slowly distilled to dryness in a Head and Body on a digestive Furnace,

nace, afforded of phlegmatick Liquor $\text{ʒvii}+$. $\text{ʒij}+$. 47. gr. and of *Caput Mortuum*, or rather of dry substance $\text{ʒij}+$. ʒij . This pulverable matter being beaten and put into a Retort, and distill'd in sand by degrees of Fire afforded $\text{ʒij}+$. 48. gr. of Oyl. But there happen'd an unlucky mistake about the Salt and Spirit : for after the latter was poured off, which weigh'd but 48. gr. the wet Salt which stuck in good quantity to the lateral and upper parts of the Receiver, instead of having been wash'd out, as it should have been, with the phlegm of the same Blood, was wash'd out with distill'd water, whence we obtained by sublimation into the neck of a glass Egg. $\text{ʒj}+$. 5 gr. of dry Salt. But by the tast of the distill'd Water whence it was sublim'd, it appear'd that all the Salt had not been rais'd: which invited me to put to it as much good Spirit of Salt as I supposed to be at least sufficient to satiate it, with
design

design to try, whether by evaporating this Mixture to dryness, and subliming Salt by the help of an Alcaly, we might not recover all, or almost all, the Volatile Salt, that had been somewhat fix'd by the Acid Spirit.

The Retort being cut, that the *Caput Mortuum* might be taken out, it was found to weigh $\text{vj} + .12 \text{ gr.}$ which being carefully calcined yielded but two Scruples and four grains of Ashes, which the Laborant said were Red. These being Elixivated, afforded eighteen grains of Salt, besides the remaining Earth or Terrestrial substance, which, I keep by me, because, notwithstanding all the violence of fire it has undergone, 'tis of a Red Colour, which seems to some to have an Eye of Purple in it.

Experiments belonging to the Primary Title of the Natural, History of Humane Blood.

Experiment III.

Spirit of Vinegar being put upon the florid *Superficies* of a parcel of Humane Blood, did very quickly deprive it of its fresh Scarlet Colour, and make it of a dark or dirty Colour.

Experiment IV.

THe Juice of a Lemmon squeez'd upon the Florid Surface of Blood, did presently somewhat impair the colour, but did not appear to alter it any thing near so much, as the Spirit of Vinegar had done.

Experiment

Experiment V.

JUice of Orange chang'd the Colour of the Florid Surface of Blood, less than Juice of Lemmons had done.

Experiment VI.

THe Black or lower part of a Portion of Humane Blood being turn'd uppermost, and thereby expos'd to the Air, within half or three quarters of an hour, (some-what more or less) acquired by the Contact of it, a pleasant and florid colour.

Experiment VII.

BUt if upon the Black Surface of the Blood some good Urinous Spirit

Spirit (as that of Sal-Armoniack) were dropt, there would be an alteration produced in a trice, and a pleasant Red colour, tho perhaps somewhat inferiour to that produc'd by the contact of the Air, would presently appear on the Surface of the Blood.

Experiment VIII.

Fixt Alcalies, or Lixivate Salts resolv'd *Per deliquium*, did likewise alter the Black *Superficies* of the Blood to a Red colour, but not so Florid or Pleasant, as that produced by the Urinous Spirit above mentioned.

Experiment IX.

THe freshly drawn Juice of the Leaves of Scurvygrafs, being dropt

dropt upon the Black *Superficies* of a lump of Humane Blood, seemed presently to make some change in the colour of it, making us judge it somewhat Reddish and inclinable to Floridness.

The seven foregoing Notes suppose it to be already known, that when healthy Blood is suffered to settle in a Porringer, that Surface of the Concreted Part, which is expos'd to the Air, will be adorned with a fine Red colour, and if the same Mass be turned upside down, that which before was the lower Surface of it, will appear of a very dark and blackish colour.

Experiment X.

HAVING for tryals sake almost filled a Vial capable of containing by guess near a pound of Humane Blood, with a mixture of
that

that Liquor, and some rectify'd Spirit of Wine, whose proportion I cannot remember, but guess it was a fourth, or eighth part: At the end of above three years, looking upon the same Glass, stop'd with nothing but a Cork, we found it coagulated, or, to speak more warily in a consistent form. And the Vessel being unstop'd, there appeared no sign of Putrefaction in the Blood; and having smelt to it, we could not perceive that it did at all stink: So Balsamick a Vertue has Dephlegmed Spirit of Wine, to preserve Humane Blood.

Experiment XI.

WE took a piece of Fibrous or Concreted Blood, of the bigness of a large Bean (or thereabouts) and having put it into a small Glass Vessel with a flattish bottom, we

we poured on it as much highly rectify'd Vinous Spirit, as might serve to cover it, tho it had been twice thicker than it was; then we lightly cover'd this Open-mouth'd glass with another, and set the Vessel in a quiet place, that the Vinous Spirit might have leisure to imbibe the serous or aqueous parts of the Blood, and thereby harden that yet soft substance; and in effect it quickly seem'd to have gain'd a superficial Crust, but the internal parts continuing yet soft, we left the Liquor upon the Blood for a day or two longer, and then we found, that the action of the Liquor had quite penetrated the lump of Blood, and made it moderately hard and friable.

This Experiment, having been made in the cold, may much confirm a Tryal elsewhere mentioned, to have been made to the same purpose; and both of them together induc'd me to fear that two or three ingenious

ingenious Writers, that in their Chymical Receipts prescribe Solutions and Tinctures of Concreted Blood in Spirit of Wine, have set down the Pompous Processes wherein these Operations are prescrib'd, rather according to Conjectures than Experience.

Experiment XII.

IT may be of some use to the Speculative, to know how much Volatile Salt of Blood is dissoluble in Water or Phlegm ; and therefore having caused an ounce of Distilled Water (for common Water, because of some Saltishness that usually accompanies it, would not have been so proper on this occasion) to be carefully weigh'd out, we put into it, little by little, some dry and white Volatile Salt of Blood, and shook it well into the Liquor, to
make

make it disperse the better; we allow'd it also a competent time for solution, and by this means we found, that ʒi. of Water would dissolve at least ʒij. that is, a fourth part of its weight of dry Salt, and that in the cold. For afterwards by the help of heat, we made the same Liquor dissolve near five and twenty Grains more. In which last part of the Experiment I had a further aim, which was to try, whether upon the Refrigeration of the Liquor, the dissolv'd Salt would not shoot into Crystals of observable Figures. But the event answered not at that time my desire; yet left me not without some intention to reiterate the Experiment, if I shall get another opportunity.

R.

Post.

P O S T - S C R I P T.

Experiment XIII.

WE put the above mentioned Solution into a Retort, to be drawn off with a pretty quick heat, (which on this occasion we prefer'd to a much slower one) and thereby obtain'd a Distill'd Liquor, that contain'd all the Volatile Salt, save a little that escaped in a dry form; which Liquor tasted strong enough to pass for quite, or at least almost, as brisk a Liquor, as moderate Spirit of Blood drawn the common way, and consequently discover'd near enough, what proportion should be taken, of the *Aqueous* Ingredient to the *Saline* when one would make such a Spirit. The knowledge of which Proportion may probably ease us of some Tryals,

als, that would otherwise be necessary to find it out, when we are (as we may often be) less stored with Spirit than with Volatile Salt, and desire to employ this in a Liquid form; in which we are wont to call it, for distinctions sake, the *Aqueous* (not the *Phlegmatick*) *Spirit of Blood*.

If opportunity had not been wanting, we would have try'd, whether by repeating the Distillation twice or thrice, a better or stricter union of the Salt and Liquor would not have been effected: and this the rather, because having ordered the Vial that contain'd this Aqueous Spirit, in which the Water had been, if I may so speak, Superonerated to be kept stopt during a Frosty Night, we perceived at the bottom of the Glass (what we had miss'd of before) a pretty deal of Volatile Salt, coagulated or shot into Crystals, tho the Crystals that were this way obtain'd,

R 2

were

were fine and clear, and some of them larger than Spangles, yet being much more numerous than we desired, by adhering closely and confusedly enough to one another, they kept us from being able to discover the Figure of particular Grains, and made me somewhat doubt, whether the single Crystals were all of them of the same shape; all that I could clearly discern, being, that divers of those Concretions were flat, thin Plates with fine Rectilinear Angles that inclin'd us to think, that if the whole Plains could have been perfectly discovered their broadest Surface would have been found Hexagonal, or of some Polygone Figures very near of kin to that.

Experiment XIV.

WE put an ounce of Distilled Water; wherein we dissolved

solv'd as much Volatile Salt of Humane Blood, as it would well take up, into a Glass Egg, and exposed it during a Frosty Night to congeal: which we did with design to discover, whether, as the Saltness that is in Sea Water keeps it here in *England* from freezing, (at least in ordinary Winters,) so the Volatile Salt of Humane Blood, which much resembles the other in Taste, would have the like effect upon Water, especially if it were fully impregnated therewith. To this Conjecture the event was answerable, the Frost having produced no Ice in our solution, nor having so much as made any of the Salt manifestly shoot, (as I wish'd it had done, hoping thereby to discover somewhat about the Figuration of the Salt of Humane Blood.)

And, *tho* afterwards we removed it into a Frigorifick Mixture, that would probably have frozen Beer and Ale, and perhaps the weaker sort of French Wine; yet we did not

R 3

perceive

perceive it to glaciare any part of our solution, but only made it let fall a pretty deal of Matter, that seemed to be Feculent, (for what it was, I had not opportunity to examine.)

Experiment XV.

Sea-salt dissolv'd in Water renders that Liquor much more difficult to be frozen, than it was before; and yet being joyn'd with Ice or Snow, the other Ingredient of our Frigorifick Mixture, it does, when outwardly apply'd, very much conduce to the Artificial Congelation of it, which usually would not succeed without it. Wherefore to try whether, *as* Volatile Salt of Humane Blood, being dissolved in Water, did, as was formerly noted, hinder it from freezing, *so* it would outwardly apply'd highly promote its

its Glaciation; we mixed by guess about a Scruple of this Salt with a convenient quantity of beaten Ice, and having put into this Mixture a somewhat slender Pipe of Glass with Common Water in it, we found, after a while, the Water that lay in the lower part of the Glass Vessel, and was surrounded by the Mixture, was turned into Ice.

Experiment XVI.

TO try some suspicions I had about the Saline and Aqueous Parts, that I thought might lie concealed in the Fibrous or Consistent part of Humane Blood, I caused some of it to be in an open and shallow Glass exposed to the Air in a Frosty Night, and the next morning found it to be lightly frozen, and the Surface of the Ice prettily figur'd with resemblances of Combs, with

R 4

Teeth

Teeth on both sides or edges ; on which account these Figures did not ill resemble those, that I have oftentimes obtained, by slowly coagulating into Salt, a solution of Sal-Armoniack made in Common Water.

In the *Second Part* of the foregoing *Memoirs*, I have not said any thing of the Medicinal Vertues of *Humane Blood* it self, (for those of the Spirit belong to the Fourth Part) and, tho I might now, if I thought fit, say something not impertinent to that Subject, in this *Appendix*, both out of some Printed Books and my own observations, yet I now forbear to do it, not only for a reason that 'tis not necessary I should here declare, but because four or five Processes that I have met with about Humane Blood in *Paracelsus*, *Burgravius*, (famous for his *Biobrychnium* made of that Subject) and one or two more, about the Transplantation

tation of Diseases by means of the Patients Blood, are such, as either I do not well understand, because of their being (probably on purpose) obscurely pen'd, or seem in themselves unlikely, of which sort is the *Biolychnium*, or *Lamp of Life*, in which 'tis pretended that the Blood is so prepar'd, that the state of Health of the Person whose it is, may be discover'd by the manner of the burning of the Flame it affords, (tho he be perhaps at a great distance from it,) and his Death by its Extinction. Besides that, as I have elsewhere noted, some Circumstances relating to the Ashes of Humane Blood, make me doubt, whether some of these Processes were not rather the Products of Fancy than Experience. And, tho I think those Medicines less improbable, that without much destroying the Texture of the Blood by Fire, aim at transplanting Diseases by its intervention, yet

I thought fit to decline transcribing the forementioned Medicines, till Experience shall warrant me to do it. And I shall also at present forbear to set down my own Tryals, because I have not yet seen the Events of them. But yet I shall invite you to endeavour with me to prepare two, that, if they succeed, may afford, especially the last of them, considerable Medicines. The first Medicine that I attempted, was, by putting to Salt of Tartar Oyl of Humane Blood instead of Oyl of Turpentine: and by keeping them long, and stirring them frequently, in the open Air, to make such a Saponary Concretion, as is not unknown to many in *London*, by the name of *Matthews's Corrector*, which as he made it with Common Oyl of Turpentine, tho it seem but a slight Composition, is yet esteemed and imploy'd with good success, by some Doctors of Physick and other Practitioners in *London*. To make the
other

other Medicine, we endeavoured to unite by long Digestion, the Salt, Spirit, and Oyl of Humane Blood, into a Mixture, which some Chymists (for their Terms are not by all of them used in the same sense) call a *Clyffus*. But having begun this, without having had time to finish it, we shall say no more of it, but that divers Chymists may not improbably look upon this sort of Compositions, as one of the noblest sort of Preparations that many a Drug is capable of.

Particulars

Particulars referable to the Third
Part of the History.

Experiment. I.

A Young Man having bled into a Porringer, and the Blood having been kept several hours, that a sufficient separation might be made of the *Coagulated* or consistent part and the *fluid*, the *fibrous* portion and the *Serum* were separately weighed : and the difference of the two masses in point of weight was not so great as one would have expected, the curdled part of the Blood weighing about six Ounces, and the *Serous* part not many drams from that weight. This Tryal is here set down by comparing it with some others, what difference there is between the Bloods of sound Persons,

as to the proportion of the *Serum*,
and the concreted part.

Experiment. II.

HUmane Urine, having first
(that I know of) by the
very ingenious Mr. *Hock*, and often-
times by me, been observ'd, when
frozen, to have on the surface of the
Ice, figures not ill resembling Combs
or Feathers; the great affinity gene-
rally supposed to be betwixt *Urine*
and the *Serum* of Blood, made me
think fit to try at once whether this
last nam'd Liquor would freeze with
such a degree of Cold, as would easi-
ly, and yet not very easily glaci-
ate water, and whether, in case it should
freeze, the Ice would have a surface
figur'd like that of frozen Urine.
But, having for this purpose expos'd
some *Serum* of Humane Blood to
the Cold Air, in two freezing nights
con-

consecutively, the *Serum* was not found to congeal, tho some Grumous parts of the same Blood did, as has formerly been noted, yet I scarce doubted, but an exceeding hard frost would have produc'd, at least a thin Plate of Ice upon the surface of our Liquor. And to confirm this Conjecture, we took the same *Serum*, and having strained it through a Linnen cloath, to separate the Liquor as much as by that way we could, from any clotted or Fibrous Parts, that might have lain conceal'd in it, we put it into a shallow, concave glass, and laid that upon some of our Frigorifick mixture, made of Ice and Salt, which we have described, and often made use of, in the History of Cold. By this means the exposed *Serum*, being frozen from the bottom upwards, there appeared here and there upon the Ice contiguous to the Air, certain Figures, that did not ill resemble those of Conglaciated Urine.

Experi-

Experiment. III.

HAVING formerly had occasion to observe that Mans Urine would tolerably well serve for what they call an *invisible Ink* : and having consider'd (when I remembred this) the great Affinity that is suppos'd to be between Urine and the *Serum* of Blood, I thought fit to try, whether the latter might not be employ'd like the former to make a kind of invisible Ink, To this effect we took some *Serum* of Humane Blood, and having dipt a new Pen in it, we trac'd some Characters upon a piece of white Paper, and having suffer'd them to dry on, we held the unwritten side of the Paper over the Flame of a Candle, keeping it always stirring, that it might not take fire. By which means the Letters that had been written, appear-
ed

ed on the upper surface of the Paper, being tho, not of an Inky Blackness, yet of a Colour dark enough to be easily legible and very like to some others that having been purpose-ly written with fresh Urine, and made visible, by heat, were compar'd with them.

*Particulars referable to the Fourth
Part of the History.*

I confess, the Defectiveness of our Historical knowledge of *Humane Blood extravasated*, has been such, that among the Authors I have had occasion to peruse, I have met with so few matters of fact delivered upon their own knowledge, that the things I have thought fit to transcribe out of their Books into this little tract, do scarce all of them together amount to half a sheet of Paper.

Paper, But yet I would not impute this Penury, either to the Laziness or the Ignorance of Writers, but rather to this that they wanted some Person, exercised in designing Natural Histories to excite their Curiosity, and direct their Attention; there being many that would enquire, if they knew what Questions were fit to be ask'd, about a propos'd subject, as for instance *Humane Blood*, and what Researches ought to be made, to discover its nature. Upon this account, I hope that after some time the foregoing Scheme of Titles, and the Papers that refer to it, will give occasion to a great many more Experiments and Observations about the Blood, (and perhaps other Liquors of the Humane Body) than hitherto have been. published by others, or are now imparted by me. Which last words I set down, because I would not be thought guilty of the vanity of pretending to have near exhausted the subject I have treated

S

of;

of; since besides other deficiencies, I now perceive that I wholly omitted a considerable Title which might either have been refer'd to the Primary ones of the first order, or employ'd as a kind of Preliminary to the Secondary Titles of the History of the Spirit of Blood. This pretermitted Title should have been of *the several ways of Distilling Humane Blood*; since according to these, the produc'd Spirit, Salt, &c. may be considerably diversify'd.

Upon this account I thought fit, to distil three Portions of dry'd Blood, each with a differing Additament. The first with a *Mineral Alcaly, Quicklime*: the next with a *Vegetable Alcaly, Calcin'd Tartar*: and the third with a *Sulphureous Acid*, Oyl of Vitriol. And, tho some Accidents kept me from prosecuting the Tryals as I desir'd, yet the first having succeeded indifferent well, and the two others not having wholly miscarried, I shall sub-
joyn

joyn the Accounts of all three as they were set down in my Notes.

Having observed that divers Bodies, when they were Distill'd with Quick lime, afforded Liquors differing from those they would have yielded, if they had been distilled, either *per se*, or with some Vulgar Additaments; we took zv . of concentered, but not dry'd Humane Blood, and having mixed it with an equal weight of Quick-lime, (such as I could procure, but not so strong as I have often seen,) we distilled it by degrees of Fire in a Retort placed in Sand, by which means we obtain'd a large Proportion of Reddish Spirituous Liquor, which did not seem considerably Phlegmatick; together with some Oyl, which was but in very small quantity, the rest being probably kept back, (and perhaps some of it destroy'd) by the Lime: and of this little Oyl that did come over, there was a small portion that sunk in the Spirit,

the rest swimming upon it.

The above mentioned Spirit being put into a small Head and Body, was set into a Digestive Furnace, to Rectify at leisure with a very gentle heat, and the Receiver was three or four times shifted, that we might observe what difference, if any, there would be betwixt the successively ascending Portions of Liquor. The first Spirit that came over did not smell near so rank as that is wont to do that is distill'd *per se*. This Observation belongs also to the three or four succeeding Portions of Liquor: probably, because the Lime had better freed the Spirit of the first Distillation from the Fatid Oyl, many of whose Particles are wont, tho unperceivedly, to mingle with it when it is drawn over without Additament. The Rectify'd Spirit, which was clear and colourless, had a tast much stronger than its smell; for a small drop of it upon the Tongue, had something of Fiery-
ness

ness that was surprizing, and lasted longer than one would wish; which made me doubt, whether the Spirituous part of the Blood had not carry'd up with it, some of the Fiery parts of the Quick-lime; which doubt, if future Tryals resolve in the Affirmative, one may expect some uncommon effects from such a Spirit, which in this case would be enriched with a kind of Volatilis'd Alcaly, a thing much desir'd by many Chymists and Physicians. Upon occasion of this suspition, we dropt a little of it into a strong solution of Sublimate in fair Water, and it seem'd at the first contact to make a Precipitate a little enclining to Yellow, (as I have observed the Saline parts of Quicklime to do in a greater measure,) tho afterwards the Precipitate appeared white, like that made with ordinary Volatile Liquors of an Urinous Nature.

But because I expected that our *Alcalisate Spirit of Blood*, if I may

so call it, would have some peculiar Qualities, discriminating it from the Spirit drawn without addition; I thought fit to make a few Tryals with it, whose event justify'd my conjectures. For having put into a Glas Egg with a slender neck, some of our well rectify'd Spirit, it did not then afford any Volatile Salt in a dry form: (tho afterwards, if I mistook not, by another Tryal, we at length obtain'd *a little*) and having continued the Tryal somewhat obstinately, we found the Spirit to have by the action of the Fire, lost its Limpidness, and to have been made muddy or troubled.

Having mingled another portion of it with a highly rectify'd, ardent Spirit, and kept them all night in the cold, no coagulation ensued, nor could we perceive any, after it had been kept divers hours in a moderate heat. But the Mixture acquired a Yellow colour, and let fall, somewhat to our surprize, a pretty deal

deal of darkish Powder, tho not enough to invite us to make any Tryals upon it.

We put to another parcel of our Spirit some good Spirit of Salt, but, tho they smok'd much at their meeting, yet we observ'd no noise nor bubbles upon their commixture.

And having mingled another Portion with Oyl of Vitriol, tho there was produc'd a very great smoke, and besides that an intense degree of Heat, (the quantity of the matter considered,) yet there was no visible Ebullition, nor any noise or bubbles produc'd, but the colour of the Oyl of Vitriol was very much heightned, the mixture growing almost red.

From these, and the like *Phænomena* one may gather, that our *Alcalisate Spirit of Blood* is in several things differing from the simple. Whether this disparity will make it a more potent Medicine, or make it, by too much participation of the

fiery parts of the Lime; a less safe Remedy, future Experience must discover. But it seems not improbable, that either as a *Medicine*, or as a *Menstruum*, if not in both capacities, it may be a not Inconsiderable Liquor. For which reason I have made my account of it the more Circumstantial.

Experiment II.

VWE tooke ʒij of Tartar Calcin'd to whiteness by equal weight of (kindled) Nitre, and mingled this Alcaly with ʒij of dry'd and powder'd Humane Blood. This mixture being distill'd in a Retort in a Sand Furnace, made it appear by its Productions, that Quicklime on these occasions acts otherwise upon the Blood than other Alcalies do. For, whereas the Distillation wherein Lime was employ'd, afforded us, as
has

has been noted, a Spirit that before Rectification was very strong, and unaccompanied with dry Salt; the *Calcinatum* of Nitre and Tartar afforded us at the very first Distillation, a Spirit less strong; but withal, so much Volatile Salt as cover'd almost all the inside of the Receiver, not now to mention the difference of their respective *Caput Mortuum*s.) And tho the strong Saline Spirit of Blood made with Quicklime, did not, as we lately noted, make an Effervescence with Acid Spirits, yet this Volatile Salt readily did it upon the affusion of Spirit of Salt.

Experiment III.

BESIDES the fixt Alcalisate Additaments, with which I distill'd the dry'd Blood of Men, I thought fit to add to it a very Acid Additament, viz. Oyl of Vitriol; and this the

the rather, because I had long since found by Tryal, (and, if I misremember not, have elsewhere related) that this Liquor being mix'd with some other Bodies, particularly with some belonging to the Animal Kingdom, did in an odd manner mingle its own substances (for I take it not to be a simple body) with them, and notably diversify the Products of the Distillation. We put therefore upon ʒiij. of powder'd Humane Blood, an equal weight of Oyl of Vitriol, and left them for some time together, to try if by the action of this Corrosive *Menstruum*, tho upon a Body not of a Mineral Nature, some heat would not be excited, and accordingly we found, that after a while, tho not at the very first, the mixture grew sensibly warm. Then we removed the Retort into a Sand Furnace, and distilling it by degrees of Fire, we had a Spirit which was preceded by a pretty deal of Phlegmatick Liquor,
of

of an odd sulphureous smell, but so strong and lasting, that I could not but wonder at it. The *Caput Mortuum* I was fain to let alone, because I had some Inducements to suppose, that it was of so compounded a nature, that I should not in my present Circumstances have the opportunity to examine it thoroughly. But it seemed remarkable, that, notwithstanding the great Acidity of Oyl of Vitriol, and the fixative power it exercises on many Bodies, where-with it is committed to Distillation, our Experiment afforded us a pretty quantity of Volatile matter in the form of a white Salt. But indeed the smell and tast of it were so uncommon, that I was troubled I had not then conveniency to examine it carefully; much less to try, whether it had any peculiar Vertues or Operations in Physick; tho I had then by me a Glass Instrument, that I purposely provided to obviate the great inconvenience that is usually met

met with, and has been often complain'd of by me as well as others, in the way Chymists are wont to imploy, when they are put to make repeated Sublimations of Volatile Saks, whether alone or with Additaments of this Instrument I cannot now stay to give you an account, but if it continue to appear as usefull as expeditious, I may hereafter do it by presenting you one ready made.

Experiment. I.

TO some Naturalists and Physicians that delight to frame *Hypotheses*, perhaps it may not be unwelcome to know, that for curiosities sake we attempted to make *Aurum fulminans*, by Precipitating a solution of Gold (made in *Aqua Regia*) with Spirit of Humane Blood, by dulcifying the Precipitate with
Common

Common water, and then drying it leisurely and that by this means we succeeded in the attempt.

Experiment. II.

HAVING into a wide mouth'd glass put as much Spirit of Blood, as would more than cover the Ball of a small seal'd Weather-glass, and suffer'd this Instrument to stay a while, that the *Ambient* Liquor and the *Included* might be reduc'd to the same temper, as to Heat and Cold; we pour'd on some Spirit of Verdegreece made *per se*, and observ'd that, tho this Spirit with some other Volatile Saline Liquors, had a very differing operation, yet working on our Spirit of Blood, with which it made a conflict and excited Bubbles, there was produc'd in the Mixture a degree of Warmth, that was not insensible on the outside of

of the glass, but was much more sensible in the Thermoscope, whose Liquor being hereby rarified, ascended to a considerable height above the former station, towards which when the conflict of the two Liquors was over, it began, tho but slowly, to return.

Experiment. III.

HAVING by degrees mix'd our Spirit of Blood, with as much good Spirit of Nitre as it would manifestly work on, there was, not without noise, produc'd great store of Bubbles by their mutual conflict; which being kept in a quiet place, till after the Liquors had quite ceased to work on one another, it began to appear, that notwithstanding all our care to free the Spirit of Blood from Oyl, something of Oleaginous that had been concealed in it, had been
been

been manifested, and partly separated, by this Operation; since not only a somewhat red Colour was produced by it, but after a while the surface of the Liquor was covered with a film, such as I have often observed in Saline Liquors, copiously impregnated with Antimony or other Sulphureous Bodies. And this thin Membrane had its *Superficies* so disposed, that looking upon it with Eyes placed Conveniently in reference to it and the Light, it did to me, and other Persons, that did not at all look on it from the same place, appear adorned with vivid Colours of the Rainbow, as Red, Yellow, Blew and Green; and as I remember, in the same order that these Colours are to be seen in the Clouds.

Experi-

Experiment. IV.

HAVING unexpectedly found amongst some other long neglected Glasses, a Vial that was written upon above twelve years before, and inscrib'd *Spirit of Humane Blood*, it appear'd to have been, by I know not what Accident, very loosely stop't : and yet not so, as to give me cause to think, that the Liquor was much wasted. But notwithstanding this, and that the Liquor had acquired a deep Colour, almost like that of Red Wine ; yet it was so dispirited and strengthless, that it appear'd to be very little other than nauseous Phlegm. Which Observation I therefore think not unworthy to be preserv'd, because by it we may guess, how little a portion of the noble and genuine Spirit or Salt, may suffice to make a Liquor pass for Spirit of Humane Blood. Ex-

Experiment. V.

IN a Frosty season we expos'd late at night two or three spoonfulls by guess of Spirit of Humane Blood, that was not of the best, being at the utmost but moderately strong. And *tho* the Cold of that season had thoroughly frozen a Vial almost full of Oyl of Vitriol, and the night where in our Spirit was exposed, was (at least) moderately Frosty, yet the next morning we did not find so much as any Superficial Ice upon it. But having remov'd the Vial into a mixture of Powder'd Ice and Common Salt we found in no very long time, that most part of the Spirit was turn'd into thin Plates of Ice, which joyn'd close together, and had their edges upwards, like those of the Leaves of a Book, when it is held with its back downwards.

T

Experi-

Experiment. VI.

TO make a further Tryal of that imperfect one mentioned in the Subordinate Title, we took a Clot of Humane Blood of the bigness of a Bean, or thereabouts, and having put it into a Vial in such manner, that that part, which before was contiguous to the Air, and for that reason, was florid, was now the undermost, and the other, which was blackish lay now uppermost, we made haste to pour upon it as much Spirit of Humane Blood, as was more than sufficient to cover it, and perceiv'd that the contact of it presently began to lessen the blackness of the surface of the Blood, and bring it to a considerable degree of Floridness; and to try whether that would continue, we stopt the Vial, and set it by till the next morning,
(for

(for it was then night,) when looking upon it, we found the Superficial Colour not to be Black but still Red.

Experiment VII.

UPon the Powder of dry'd Humane Blood we put (in a small Vial) some of the rectify'd Spirit of Humane Blood, which quickly dissolv'd part of it, and acquired a deep and pleasant Colour. But highly rectified Spirit of Wine, being put upon some of the same Powder in a like glass, did not in many hours acquire any manifest Tincture, and got but a pale Yellow one, even after having been for a longer time kept in a moderate heat. And yet Common water, being put upon another portion of the same Powder, did quickly enough appear, by the Colour it acquired, to have dissolved a pretty deal of it.

Experiment VIII.

SOME of our Spirit of Humane Blood being put upon some curious Vitriol, that I had as a Rarity (if I mistake not) from the *East Indies*, part whereof was in lumps, and part beaten to Powder; that Liquor which was put upon the former, being able to dissolve it but slowly, made little or no Froth; but the Spirit that was put upon the latter, by hastily working on it produc'd a manifest one. And the Solutions made, of both parcels of Vitriol, were of a deeper and more lovely Blew, than the Mineral it self had been: nor did I observe in them any Precipitate of a dark Colour, as I have done upon the Mixture of Spirit of Urine and Ordinary Vitriol.

Experi-

Experiment IX.

HAVING with a clean Pen drawn some Letters upon white Paper with Spirit of Humane Blood, and as soon as 'twas dry, mov'd the unwritten side over the Flame of a Candle, we found that this Liquor may for a need be imployed, as an *invisible Ink*, that seemed to be somewhat better, than those formerly mentioned to have been afforded us by *Serum* and Urine.

Experiment X.

HAVING found by Tryal that divers Salts, some that are Volatile and some that are not, being put in Powder into water, will whilst they are dissolving, sensibly refri-

T 3

gerate

gerate it; and on the other side that some very subtil Spirits actually cold, being put into cold Water, will quickly produce in it a sensible warmth, I thought it would not be amiss to try, what Spirit of Humane Blood would do, when employed after the same manner. Having therefore placed a sealed Thermoscope in an open mouthed glass, furnished with as much distilled water as would cover the Ball of the Instrument, we left it there for a while to bring the internal Liquor and the external to the same degree of Coldness. Then we poured upon the immersed Ball two or three spoonfuls of Spirit of Humane Blood (which was all we could spare for this Tryal) but perceived very little alteration to ensue in the Thermoscope, only that it seemed, the Spirit of Wine in the stem did a little, and but a very little, subside which effect (tho it had been much more manifest) I should not have been surprized

priz'd at, partly because I found Spirit of Urine to have a like, or somewhat more considerable effect, and partly because I remembred, what I elsewhere relate about the Operation of the pure Salt of Humane Blood upon Distill'd Water; which Liquor I therefore make use of in these and many other Experiments, because in our common Pump-Water or Well-Water, and in most other common Waters, I have observed a kind of common Salt, which tho in very small quantity, makes it apt to coagulate with, or precipitate, some kind of Saline Corpuscles, whether more simple, or more compounded. But before I quite dismiss the lately recited Experiment, I must acknowledge, that I dare not acquiesce in it. Since probably the effect of the Spirit of Blood would have been more considerable, if I had been furnish'd with a sufficient quantity of it, to pour into the Water.

Experiment XI.

INto a slender Cylindrical Vial we put Filings of Copper, more than enough to cover the bottom, and then pouring on some Spirit of Humane Blood, till it reach'd about an Inch above the Filings, we stoppt the Glass close, and, as we expected, the *Mensstruum* dissolv'd some of the Metal, and acquired upon it a deep ceruleous colour, which by keeping the Vessel in a quiet place for some days, did by degrees disappear, and left the Liquor like Water. And then the Glass being unstopt, there did, as was expected, appear a fine Blew surface on the confines of the Air and the Liquor, in a Minute of an hour or less; and this fine colour extending it self downwards, was in no long time diffus'd through the whole Body of the
the

the Liquor ; and that so plentifully, as to render it almost opacous. But, tho I kept the Glas many days after well stop't, yet (whether it were that there was too much Air left in the Vial, or for some other reason) the colour did not disappear, as was expected, but continued very intense. This may confirm and diversifie an Experiment related in the thirteenth Title of the Fourth Part of the Memoirs.

Experiment XII.

IT is not only upon Copper in its perfect Metalline form, but by Nature it self Embryonated in, or blended with stony matter, that our Spirit of Humane Blood did manifestly work : for having pour'd some upon well powdered *Lapis Armenus*, the Liquor did even in the cold, and in no long time, (for it exceeded

exceeded not a few hours) acquire a deep and lovely Blew, almost like the solution of Filings of Crude Copper, made with the same *Menstruum*.

THE CONCLUSION.

ANd here, Sir, I shall at length dismiss a Subject, about which I now perceive I have already entertained you much longer than at first I imagined. And yet, if I prevail with you, your trouble is not quite at an end; since I must exhort you to take the pains, for your own satisfaction and mine, to try over again such of the foregoing Experiments, as you shall judge likely to be

be of a contingent Nature. For, *tho* I hope you'll do me the right to believe, that I have as faithfully as plainly delivered Matters of Fact, without being bias'd by Hypotheses, or aiming at Elegance, yet my Exhortation may be reasonable. For I have observ'd Humane Blood to be a thing so diversifyable by various Circumstances, and especially by the Habitual Constitution of the person that bleeds, and his present condition at the very time of Phlebotomy, that I dare not undertake, that every repeater of the like Experiments with mine, will always find the Events to be just such as I have recited mine to have had. Nay I dare not promise my self an exact uniformity of successes, even when I my self shall reiterate some (of the nicer) of my own Tryals; especially if I can do it, as I desire with greater Quantities of Blood than (for want of them) the first were made with.

To

To the Particulars already deliver'd in order to the History of Humane Blood, I could now, Sir, add some others, if Time and Discretion would permit me to do it. For, as little cultivated as the Subject has been, I found it not so barren, but that, whilst I was delivering some Tryals concerning it, the consideration of those, and of the Nature of the thing, suggested new ones to me. But 'tis high time I should break off an *Appendix*, that, being but a Rhapsody of the Notes and other things, that have occur'd to me since the Memoirs were written, may I fear, seem already too prolix, as well as confused. I do not forget, that the two last Subordinate Titles of the Fourth Part of the Memoirs, concern the External and Internal use of the Spirit of Blood in Physick; and that therefore perchance it may be expected, that I should here add some Experiments or Observations, relating to those
Titles.

Titles. But I hope the lately mentioned Reasons, and my just backwardness to part with some of them, because they are not yet finished, will make you easily excuse my laying them aside; which I am like to do long, unless you, and your Learned Friends shall peremptorily require them of me, in a fitter season than this; in which some occasions, that I cannot dispense with, call me off to other Employments, and oblige me to leave a further inquiry into this Subject to your self, and those able profess'd Physicians, who have, as well more Obligation, as more Ability than I, to pursue it effectually. This I may well hope that you and they will do, since upon a cursory review of a part only of what I have written, so many things sprang up even in my thoughts, as *Original Tryals*, if I may so call them, or as other things fit to be further consider'd, that I perceived 'twould not be difficult to encrease the *Appendix*,
by

by two sorts of particulars; the one made up of *designed Experiments*, that is, such as have not yet been try'd, and yet seem worthy to be so, (to which 'tis probable our excellent *Verulam* would have given the Title of *Historia Désignata* :) the other should consist of such Tryals as I call *Succedaneous Experiments*, that is, such as I intended should be made upon the Blood of Beasts, in such Cases and Circumstances, wherein the Blood of Men, either cannot be had, or ought not to be procured. When I shall next have the happiness to converse with you, you may command a sight of what I have drawn up of this kind. And, if God shall please to vouchsafe me Health and Conve- niency, I may perhaps (for I must not absolutely promise it) offer you what *Addenda* have occur'd to me, as things not unfit to make way for a more copious, and less unaccurate, Scheme of Titles, such as those that in the first part (of the Memoirs) are call'd
Titles

Titles of the Second Classis, or Order :

for which Scheme I was the rather invited to think it fit, Materials should be by some body provided, because second thoughts made me sensible that the Particulars compil'd in this small Book, come far short, (as I lately acknowledged, and you will easily believe,) of comprizing all that should and may be known of so noble and useful a Subject, as I have ventur'd to treat of. And I will freely confess to you on this occasion, that for my part, in the prospect I have of the future Advancement of Humane Knowledge, I think most of those *Virtuosi* that now live, must content themselves with the satisfaction, of having imploy'd their Intellects on worthy Objects, and of having industriously endeavour'd, by promoting useful Knowledge, to glorify God and serve Mankind. For I presume, that our enlightned Posterity will arrive at
such

such attainments, that the Discoveries and Performances, upon which the present Age most values it self, will appear so easy, or so inconsiderable to them, that they will be tempted to wonder, that things to them so obvious, should lye so long conceal'd to us, or be so much priz'd by us; *whom* they will perhaps look upon with some kind of disdainful Pity, unless they have either the equity to consider, as well the smalness of our helps, as that of our Attainments; or the generous gratitude to remember the Difficulties this Age surmounted, in breaking the Ice, and smoothing the way for them, and thereby contributing to those Advantages, that have enabled them so much to surpass us. And since I scruple not to say this of those shining Wits and happy inquirers, that illustrate and ennoble this learned Age, I hope you will not think that I, who own my self to be more fit to celebrate

brate than Rival them, would dis-
swade you from improving and sur-
passing the slight Performances,
that are in this little Tract submit-
ted to your Judgment by,

Sir,

your very Humble Servant.

Knightsbridge,

December 22, 1683.

F I N I S.

U A

A Catalogue of late Physick Books
sold by Samuel Smith, at the Prince's Arms in St. Pauls Churchyard.
Fol.

Boneti Anatomia, 2 Vol. 1680.
— Mercurius, 1682.

Breunii Plantarum Exoticar. Cent. cum Figuris, 1680.

Tabritii Hildani opera cum Severino, 1682.

Hippocratis Opera Fattii.

Dioscoridis Opera, G. Lat.

Saxoniæ Opera. Med. 1680.

Piso Hist. naturalis de rebus Indiæ.

Schenki Observat. Med.

Mentzelii Index Plant. cum Figuris, 1683.

Lepenis Bibliotheca Med. 1683.

Riverii Opera, 1679.

Zwelferii Pharmacopeia.

Quartoes.

Baubini Pinax cum Prodromo.

Broeckhuysen Oeconomia Corporis Anim. 1683.

Boyle Opera omnia, 2 vol.

Blasii Anatomia, 1681.

Borellus de motu Animalium, 2 vol.

Bleny Zodiacus Galen. Med. Chymicus, 1682.

Bartbolini Acta Medica.

Castelli Lexicon Med. 1682.

Cardilucii Officina Sanitatis.

Clauderii Methodus Balsamandi.

Cleyer Specimina Medicinæ Sinica, 1682.

Charas Pharmacopeia Regia, 1683.

Diemer-

Diemerbroeck Anatomia.
Fernelii Opera, 1683.
Van Helmontii Opera, 1682.
Gockelii Deliciae Academicae, 1682.
Hoffmanni Praxis Med. 1680.
Helwigii Observationes Med. 1680.
Hoffmannus in Schroderum.
Joel Opera medica.
Kyperi Anthropologia corporis humani.
König Regnum Animale, 1682.
Kirckringii Specilegium Anatom.
Licetus de Monstris.
Museum Hermetic.
Miscellanea Curiosa M. Physica, 7 vol. 1682.
— Id. Decuria secunda Anni Primi, 1683.
Margraui Materia Medica.
— Prodomus.
Regii Medicina.
Roslinchius de purgantibus, 1683.
— Ordo & Methodus Med. Specialis.
— Concilia Med.
Sylvii Opera Med.
Schorkii Pharmacopeia.
— Hist. Moschi.
Ang. Sala Opera med, 1682.
Swammerdam miraculum Naturae.
Vigerii Opera med.
Verfaschæ de Apoplexia.
Waltheri Sylva medica.
Welschii Decades X. med.
Wedelii Opiologia.
— Physiologia Med.
— Pharmacia.

— de medicam. facultatibus.

— de medicam. compositione.

Wepfers cicutæ Aquatica.

Zwelfers Pharmacop.

Octavos.

Borelli Observat. Med.

Bartol. Anatomia.

Beckers Physica subterranea cum supplemento,
1681.

Brunners Experimenta nova circa Pancreas,
1682.

Camerarii Sylloges memorabilium Med.
2 vol. 1683.

Deckers Exercitationis Med. pract.

Dodonai Praxis Medica.

Franchimont Lithotomia Med. 1683.

Funerwalfi Anatomia.

Gockelii Concilia & observat. Med. 1683.

De Graaf Opera.

Grukebius de Hydrope, 1681.

— De Bile, 1682.

Hartmanni Praxis Chymiatrica, 1682.

Heido Anatomie nyctuli & observat. Med.
1684.

Hippocratis Opera, 2 vol.

Juncken Chymia Experimentalis, 1681:

Medicus presentis Seculo Accommodat. 1682.

Liseri Culter Anatomicus:

Marchetti Anatomia:

Meekren Observat. Med. Chyrur. 1682:

Mereti Pinax:

Plateri Observat. Med.

Peonis & Pythagor. Exercit. Anat. & Med.
1682:

Riverii

Riverii Institutiones :

Schroderi Pharmacopeia :

Swalve Quarela Ventriculi :

— *Alcali & acidum :*

Tilingii Liliū Curiosum, 1683 :

Tilingii Prodrōmus, med.

Verſaſcha Obſervat. med.

Wepſeri de Apoplexia :

Wuten memoria medicor.

Zypai Fundamenta med, 1683 :

Twelveſa.

Barthol. De Ovariis :

— *De Unicornu :*

— *De Pulmonum ſubſtantia :*

Beugben Bibliographia Med. & Phyſica,
1682 :

Barbetti Chyrurgia :

— *Praxis cum notis Deckerii :*

Beguini Tyrocinium Chymicum :

Cornelii Catalogus Plantarum, 1682 :

Drelincourt Præludium Anat.

Guiuri Arcanum Acidular. 1682 :

Gliffoni Opuscula, 3 vol.

Van Helmont. Fundamenta Med. 1682 :

Hoffmanus de uſu Lienis, &c. 1682 :

Harvey de Gener. Animal.

— *De motu cordis :*

Kirckring. in Baſil Valent. currum Triumph.

Kunckelii Obſervat. Chymia, 1681 :

Le Mort Compendium Chymicum, 1682 :

Mauro Cordatus de motu Pulmonum, 1682.

Macafii Promptuarium Materiæ Med.

Matthai

Matthæi Experimenta Chymica, 1683:
Muis Praxis Chyrurgica duabus partibus,
1684.

Morelli Methodus perscribendi formulas Re-
medior.

Primerose ars Pharmac.

Pocket Anatomia:

Redus de Insectis:

Reidimi Observ. med.

Rivini de peste Lipsiensis. 1680:

Smitzsi Compens. med. 1682:

Stockhameri Microcosmographia, 1682:

Verle Anat. Oculi:

Vigani Medulla Chymicæ:

Advertisement.

THAT these above mentioned Books in
Physick and Chymistry, with many
other Forreign Books, are sold by *Samuel*
Smith, at the *Prince's Arms* in *St. Pauls*
Church-yard; and that he will furnish him-
self with much variety of new Books in that
kind, from time to time, as they shall come
from *Franckfort Mart*; and likewise he can
procure such other Books for Gentlemen,
which perhaps are not to be met with here,
from his Correspondents, if to be had, be-
yond Sea.

Books Printed for, and sold by *Samuel Smith*.

THE Philosophical Transactions pub-
lished by the Royal Society Monthly,
be-

beginning *January* 1683:

The whole Art of the Stage, &c. Translated out of French: In *Quarto*, 1684. price 5. s.

A new History of *Ethiopia*, being a full and Accurate Description of the Kingdom of *Abyssinia*, vulgarly, though erroneously, called the Empire of *Prester John* in four Books (illustrated with many Copper Plates) and also a new and exact Map of the Countrey, and a Preface shewing the usefulness of this History; with the life of *Gregorius Abba, &c.* By the learned *Job Ludolphus* Councillour to his Imperial Majesty and the Dukes of *Saxony*, and Treasurer to his Highness, the Elector *Palatine*, In *Fol.* 1684. Price 12. s.

Guideon's Fleece, or a vindication of the Colledge of Physicians, in answer to a Book intituled the Conclave of Physicians. By *Dr. Harvey*, in *Quarto*, 1684. Pr. 6. d.

An Anatomical account of an Elephant which was lately Dissected in *Dublin*, June 17, in the year 1681. By *A. M. Med.* of *Trinity Colledge* near *Dublin*, illustrated with Cuts, in *Quarto*, 1682. Price 1. s.

Swammerdami (Joban.) Amst. M. D. *Miraculum Naturæ.* In *Octavo*.

The true method of curing Consumptions. By *S. H. Med. D.* 1683. Price 1. s.

A Discourse about *Bagnio's*, and Mineral Baths,

Baths, and of the drinking of Spaw Water, with an Account of the Medicinal Vertues of them, and also shewing the usefulness of Sweating, Rubbing, and Bathing, and the great benefit many have received from them in various Distempers. By S. H. Med. Doct. 1683. Price 1. s.

Miracles, Works above and contrary to Nature; or an Answer to a late Translation out of Spinoza's Tractatus Theologico-politicus, Mr. Hobs Leviathan, &c. in Quarto, 1683. Price 1. s.

A Treatise of Self Examination, in order to the worthy receiving the Holy Communion. By Monsieur John Claude Minister of the Reformed Church at Paris: Translated from the French Original, in Twelves, 1683. Price 1 s.

Protestancy to be Embraced; or a new and infallible Method to reduce Romanists from Popery to Protestancy. By Dr. Abercromby, M. D. in Twelves, 1683. pr. 1. s.

The Art of Divine Converse, being a New Years-Gift, directing how to walk with God all the year long, (by the same Author) in Twelves, price 6 d.

The Councils of Wisdom, or the Maxims of Solomon, in Twelves, 1683. pr. 1 s.

The Ten Pleasures of Marriage. In Twelves.

The Dutch Rogue, or Gusman of Amsterdam, traced from the Cradle to the Gallows, 1683. In Twelves.



